DEPARTMENT OF SOCIAL ECONOMY
FOR THE
UNITED STATES COMMISSION TO THE PARIS EXPOSITION OF 1900

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ON

AMERICAN SOCIAL ECONOMICS

EDITOR
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Professor of American History in Johns Hopkins University

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RICHARD WATERMAN JR

XIX

THE PAST AND PRESENT CONDITION

OF

PUBLIC HYGIENE AND STATE MEDICINE

IN THE

UNITED STATES

BY
SAMUEL W. ABBOTT
Secretary of the State Board of Health of Massachusetts

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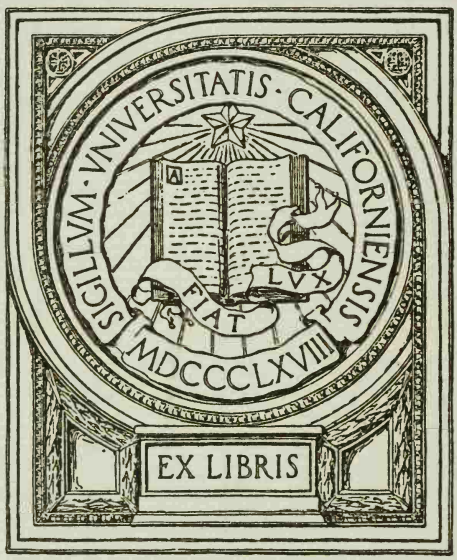

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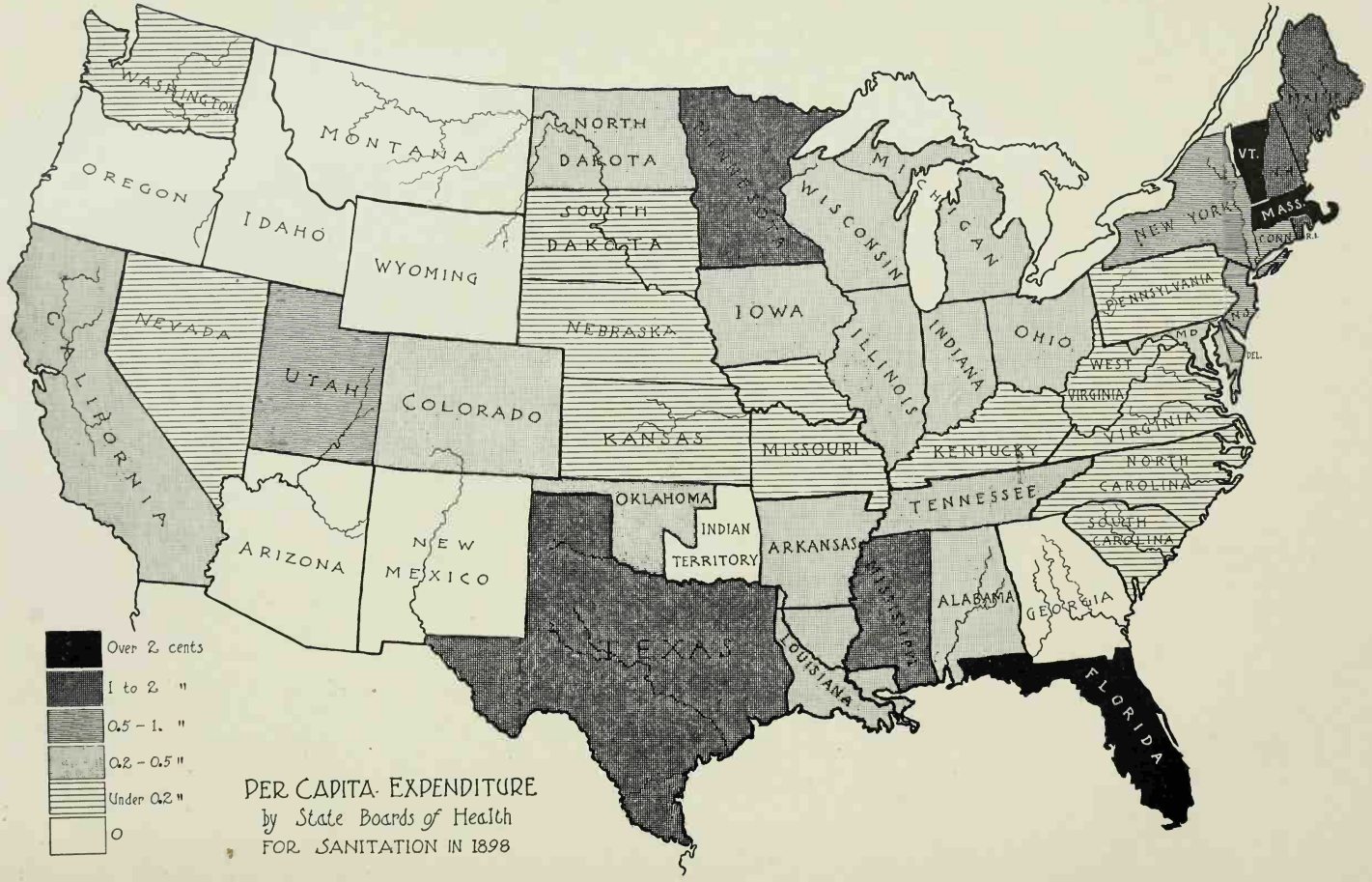
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PER CAPITA EXPENDITURE
by State Boards of Health
FOR SANITATION IN 1898

DEPARTMENT OF SOCIAL ECONOMY

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The six statistical maps of the United States published in this monograph were prepared by Prof W. Z. Ripley of the Massachusetts institute of technology.

Introductory

In the following monograph it is the writer's intention to show in as brief a manner as possible the progress which has been attained in the United States in matters pertaining to the public health. The chief topics relating to this subject will be presented concisely, and lengthy details will be avoided except in a few illustrative instances. The term "hygiene" is well defined as follows in the introductory sketch by Dr John S. Billings in Buck's *Treatise on hygiene and public health* (New York 1879) to which the reader is referred for a full discussion of its history in the United States. Other excellent sketches may be found in some of the annual addresses of the presidents of the American public health association and in other published papers of the same character in the proceedings of that association.

In its broader sense, the study of hygiene includes the examination of the conditions which affect the generation, development, growth and decay of individuals, of nations, and of races, being on its scientific side coextensive with biology in its broadest sense, including sociology, rather than with physiology merely, as some writers state.

He further says:

It can be shown that the direct pecuniary loss to this country on account of preventable sickness and mortality is certainly over $100,000,000, annually, and this without taking into account expenditures incurred on account of sickness, etc., or the unusual losses due to great epidemics, both from waste of life and injury to commerce.

It is evident, therefore, that hygiene is not only a subject of scientific interest to the student, or to medical men, but that to the political economist and to the legislator its problems and discoveries ought to be of great practical importance — greater, in fact, than many of the subjects with which those gentlemen usually occupy themselves; and, at first sight, it may seem strange that it should not receive more attention and consideration from politicians

and legislative bodies than we actually find to be the case. A standing committee on public health would be about the last committee that either congress or a state legislature would think of organizing.

The foregoing statement was published just 20 years ago, and as a proof of decided change of sentiment upon this subject it is a fact that such committees now form a part of the organizations of state legislatures in very many of the older states, and are also supplemented by other committees organized for the consideration of water supplies, sewerage and drainage, and other questions pertaining to public hygiene.

The term **"state medicine"** is a broader term than public hygiene since the former includes the latter, together with legal medicine, medical education, and all subjects which treat of the relation of the physician to the state. In this monograph the two topics of medical registration and the inquest laws have received consideration since very decided progress has taken place in the former in nearly every state, and in a few states the inquest laws have been entirely remodeled.

The **discoveries of Pasteur** have revolutionized, not only many of the departments of medicine, but also the operations of agriculture, and the states of the Union have not been slow to recognize the value of his work, and of its important bearing on the welfare of the human race, and to apply the principles involved in Pasteur's discoveries to the rapidly increasing population of the new world.

Dr Jenner had discovered and brought to public notice the **protective power of vaccination** at the very threshold of the 19th century, and **Dr Waterhouse** of Cambridge, Mass. had sent to Dr Jenner within a few months of his discovery, for a supply of lymph, from which the practice was introduced in the eastern states of the Union. Very soon after this no less a personage than the third president of the United States, **Thomas Jefferson,** sent to Dr Waterhouse for supplies of lymph, and from these sources the practice soon spread throughout every town and hamlet in the 13 thinly settled

states of the Union. As a necessary result the death-rate from small-pox in the United States in the 19th century has been reduced to a mere fraction as compared with that of the 18th.

But, while Jenner had by observation and experiment found out the value of vaccination, he neither comprehended nor recognized the foundation principle which accounts for the spread of all contagious diseases — the **germ theory of infection,** the true natural history of which was not understood till the latter half of the 19th century, when Pasteur had first penetrated the veil, and was soon followed by a host of other observers who have pursued similar lines of inquiry in regard to the nature of cholera, typhoid fever, yellow fever, diphtheria, tuberculosis, anthrax, tetanus and other diseases. Having once learned the source and methods of infection in the different kinds of diseases, it remained to apply the knowledge thus gained to the great and important work of disease prevention.

It is the exercise of this function, **the prevention of disease,** which forms the first and most important duty of sanitary authorities.

In a monograph of this character the various topics pertaining to public hygiene must necessarily be treated in an extremely concise, condensed manner, and must also be shorn of extended details. It is for this reason, therefore, that a few tables of statistics have been introduced in order that the facts relating to the subjects may be given in the least possible space.

If the writer were called upon to state in the briefest manner possible what are the **most prominent points** in relation to **public health** in the United States, to-day, he would mention **first** of all the marvelous rapidity with which the introduction of **public water supplies** has been effected in the past 25 years, specially in the states west of the Mississippi valley. **Second,** the stimulus which has been given to the methods employed for **preventing the spread of infectious diseases,** through the agency of **bacteriological investigations** and the

establishment of public and private **laboratories** for aiding sanitary work.

Third, the necessity of providing a central bureau or department, having authority to collect the **vital statistics** of the United States, from the different states and territories, and to publish the results of the same. It should also be the duty of such bureau to secure uniformity in the methods of collection and presentation in all parts of the country.

Fourth, the need of one strong, **central sanitary organization** at Washington to cooperate with and to aid state and municipal sanitary authorities in every branch of public hygiene. The duty of collecting and publishing the vital statistics of the country might properly be entrusted to such an organization.

The imperfect character of some of the observations noted in this monograph is accounted for by the fact that all of the information obtained from sanitary authorities, of whatever kind, has been entirely voluntary, and consequently less complete than that which could have been obtained by a national sanitary authority authorized to collect information by statutory requirement, had such an authority existed. The thanks of the compiler are, therefore, the more heartily extended to all those authorities who have cheerfully aided him, at the cost of considerable time and trouble, with such information as was sought.

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Organization of State Boards of Health

Public health in the United States, as in all other countries, has been a question of evolution from small beginnings, and is **of comparatively recent growth.**

The **laws** relating to this subject enacted by the general government and by the states **reflect** the **attitude of the people.** The number of such laws which appear in the early history of the colonies is not large. It is, however, a matter of interest to know that the early settlers soon after arriving in America recognized the need of definite knowledge on this subject, and of preserving their records, which constitute the foundation stone of public hygiene, by enacting a law in 1639, that "there be records kept, . . . of the days of every marriage, birth, and death of every person in this jurisdiction".

Progress in this direction **during** the first **two centuries** of the new nation's growth was **slow** and proportionate to the sparsity of the new settlements, density of population, from necessity constituting a prime factor in promoting public health measures.

Up to the close of the 18th century, and for several decades of the 19th, almost the only health legislation which was enacted in the different states of the Union consisted in a few laws relating to small-pox, since this pestilence was scarcely ever absent for many years at a time from any city, town or village, till after the general introduction of vaccination.

A serious epidemic of cholera prevailed in Europe in 1831, reaching America in 1832, and invading the country by way of Quebec and Montreal, scarcely any of the cities and large towns escaping its ravages. New Orleans alone lost more than 8000 of its citizens from this cause, out of a total population of about 55,000. But this epidemic does not appear to have taught the lesson of public health and cleanliness, and it was reserved for the epidemic of 1848 and 1849 to thoroughly

arouse the people to the importance of initiating public sanitary measures. A case of cholera had already been reported at quarantine in New York harbor in December 1848, the disease was prevailing with unusual severity in eastern countries, and there was great fear, specially in the eastern states of the Union (which were then more permanently occupied with settled towns and cities than the western states), lest the experience of 1832 should be repeated. It was this condition of affairs which undoubtedly led the Massachusetts legislature of 1849 to enact a resolve calling for the **appointment of a commission to make a sanitary survey** of the state and to report upon the same.

This commission was appointed by the governor of Massachusetts, July 3, 1849. The appointment was made none too soon, for in that year the general sanitary condition of the state, as shown by the succeeding report of the commission, as well as by the unusually high death-rate, was deplorable. Only a few towns had then introduced public water-supplies, cholera was beginning to appear again, and dysentery and other infectious diseases were more destructive than they had been for many years.

The **report** of that **commission** was an extremely valuable document. It was at once intelligent, thorough, comprehensive and prophetic, and though several years elapsed after its publication before a general board of health was established in any state,[1] it is nevertheless true, that when such boards were established, the general plan laid down in this report was adopted, and now appears essentially in the organic acts establishing such state boards throughout the Union.

The **first 3 state boards of health** were organized in 3 widely separated states, Louisiana, Massachusetts and California, in the order named; and these were followed by

1) The Louisiana board created in 1855 could hardly be classed as a state board of health though so named in its organic act, since it was created almost entirely for maintaining a quarantine to protect the city of New Orleans. See appendix 3.

the establishment of similar general boards in Virginia, Minnesota and Michigan. The states and territories which have thus far established state boards of health, with the dates of organization, are given in the following list:

Louisiana, 1855
Massachusetts, June 1869
California, March 1870
Virginia, February 1872
Minnesota, March 1872
Michigan, 1873
Maryland, April 1874
Alabama, January 1875
Georgia, June 1875
Colorado, February 1876
Wisconsin, March 1876
Mississippi, February 1877
New Jersey, March 1877
Tennessee, March 1877
Illinois, May 1877
Connecticut, January 1878
Kentucky, March 1878
Rhode Island, April 1878
South Carolina, December 1878
Delaware, 1879
North Carolina, 1879
Iowa, March 1880
New York, May 1880
Arkansas, March 1881
Indiana, March 1881
West Virginia, March 1881
New Hampshire, August 1881
Missouri, March 1883
Maine, February 1885
Kansas, March 1885
Pennsylvania, June 1885
Ohio, April 1886
Vermont, November 1886
Florida, February 1889
North Dakota, 1889
Nebraska, March 1891
Washington, March 1891
Oklahoma, March 1891
South Dakota, March 1891
Nevada, March 1893
New Mexico, February 1895
Utah, February 1898

Further comment on the organization of these boards may be found in appendix 3.

As social civilization has proceeded from the less to the greater, from the town and city to the county, and from the aggregation of these to the state, and then to the general government, so also the history of sanitary organization shows a similar order, the town board being the earliest unit of sanitary authority, then the state boards, and finally the national board which was not organized till 1879.

The **city or town board of health** is and always has been the most firmly established organization, and is usually clothed with the most arbitrary powers for the protection of each local community or municipality.

In general, it may be said that the **work of state boards of health** has not been largely of an executive character, but has been **eminently didactic,** and much good has been accomplished by the publication and distribution of tracts, circulars and pamphlets relating to the various departments of public health, and by the holding of frequent conventions or assemblies for the free discussion of sanitary subjects.

As a general rule state boards of health do not have authority over local boards in sanitary matters,[1] but in some instances are authorized to exercise coordinate power with them in preventing the spread of infectious diseases, either within the limits of municipalities or along the border of other states or countries.

The most important branch of public hygiene is the **management and control of infectious diseases,** and while the state boards of health are, from their necessary composition, not so closely in touch with the people as the municipal boards, yet they are capable of doing excellent service in educating the people in this important sanitary question. In those states which are the most densely settled, and are of comparatively small area, it has been possible for the general boards to perform a considerable amount of executive work, and to carry out the provisions of such laws as have given them authority to act for the protection of the public health.

In several of the states, notably those of the western part of the Union, the function of **regulating the practice of medicine** has been added to the more distinctive duties of public sanitation.

A valuable summary of the powers and duties of state boards of health as they existed in 1879, may be found in Dr Billings' *Introduction to the volumes on hygiene* published in New York by Dr A. H. Buck.[2] In this summary Dr Billings says — "The state board of health should be the central

1) See appendix 3, for note on a new law of the state of Indiana.

2) A *Treatise on hygiene and public health*, edited by Albert H. Buck, M.D. v. 1, p. 55. W. Wood & Co., N. Y. 1879.

supervising authority, having much the same relation to local boards, that the local board has to the households. Its functions may be classed as follows: 1) to promote the organization of local and municipal boards; 2) to obtain medical and vital statistics; 3) to investigate the causes of undue sickness and mortality; 4) the removal of these causes, acting as far as possible through the local sanitary authorities; 5) the supervision of the hygiene of state institutions; 6) the supervision of quarantine."

The following table presents the **per capita expenditure** of each state board of health in 1898, upon an estimated population for that year. For a more extended explanation and table see appendix 1, and chart facing title-page.

ANNUAL PER CAPITA EXPENDITURE OF STATE BOARDS OF HEALTH

(POPULATION ESTIMATED TO 1898)

Groups	States and territories	Fraction of dollar	Francs
Over 2 cents	Florida	.0866	.450
	Vermont	.0301	.160
	Massachusetts	.0236	.120
1 cent to 2 cents	Rhode Island	.0167	.087
	Texas	.0144	.075
	Mississippi	.0141	.074
	Maine	.0112	.059
	New Hampshire	.0106	.055
	Minnesota	.0105	.055
5 mills to 1 cent	Utah	.0098	.051
	Connecticut	.0092	.048
	New Jersey	.0089	.046
	Delaware	.0070	.037
	New Mexico	.0055	.029
	New York	.0052	.027
2 mills to 5 mills	Maryland	.0049	.026
	Colorado	.0042	.022
	North Dakota	.0040	.021
	Ohio	.0040	.021
	Louisiana	.0040	.021—
	Arkansas	.0036	.019
	Michigan	.0035	.018
	Oklahoma	.0032	.017
	Tennessee	.0029	.015
	Wisconsin	.0028	.015
	California	.0027	.014
	Iowa	.0023	.012
	Indiana	.0021+	.011
	Illinois	.0021	.011
	Alabama	.0020	.010
Less than 2 mills	West Virginia	.0017	.009
	Missouri	.0016	.008
	Kansas	.0015	.008
	Nevada	.0015	.008
	Kentucky	.0012	.006
	South Carolina	.0012—	.006
	North Carolina	.0011	.006
	Virginia	.0011	.006
	Pennsylvania	.0010	.005
	South Dakota	.0010—	.005
	Washington	.0007—	.003
	Nebraska	.0001	.0006
0	Arizona	.0000	.000
	Georgia	.0000	.000
	Idaho	.0000	.000
	Montana	.0000	.000
	Oregon	.0000	.000
	Wyoming	.0000	.000

National Health Organization

At the present time the United States is in the unfortunate position of being **without any general health organization** representing the national government, which can in any manner be compared with those of the countries of Europe, for example, the Comité consultatif d'hygiène of France, the Imperial board of health of Germany, or the Local government board of England.

It is proper in this connection to give a brief review of the establishment, **history and overthrow** of the **National board of health** of the United States. The stimulus which led to the formation of this board was undoubtedly the same which has proved to be the initiative in the establishment of other similar general organizations, namely, the unusual prevalence in some part of the country of an epidemic disease. Asiatic **cholera** had visited the country in 1872 and 1873 to such an extent as to lead to the appointment of a commission by congress to investigate the prevalence of the disease and to report on it.[1]

This epidemic became general throughout the southern and western states, but did not extend eastward beyond the Alleghany mountains. Another disease which has visited our shores at irregular intervals, coming invariably from tropical regions south of the United States, is **yellow fever.** Wherever it makes its appearance the population becomes alarmed, is more or less demoralized, and industry is paralyzed for the time being. In 1878, yellow fever had prevailed with unusual severity in the Gulf states and Tennessee, and to some extent in Kentucky and Missouri, and had caused the death of nearly 16,000 persons out of a total of about 74,000 cases.[2]

These facts proved to be a sufficient incentive for the organization of a **general board of health** which should have

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1) See *U. S. government report upon cholera in 1873*, 43d Cong., 2nd session. Ex. doc. No. 95.

2) Dr Sternberg in *Wood's reference handbook*. v. 8, p. 45.

in charge the sanitary interests of the whole country — and in March 1879, the following act was passed by congress creating a National board of health:

AN ACT TO PREVENT THE INTRODUCTION OF INFECTIOUS OR CONTAGIOUS DISEASES INTO THE UNITED STATES, AND TO ESTABLISH A NATIONAL BOARD OF HEALTH

Be it enacted by the senate and house of representatives of the United States of America in congress assembled:

§ 1 That there shall be established a National board of health to consist of seven members, to be appointed by the president, by and with the advice and consent of the senate, not more than one of whom shall be appointed from any one state, whose compensation, during the time when actually engaged in the performance of their duties under this act, shall be $10 per diem each and reasonable expenses, and of one medical officer of the army, one medical officer of the navy, one medical officer of the marine hospital service, and one officer from the department of justice, to be detailed by the secretaries of the several departments and the attorney-general, respectively, and the officers so detailed shall receive no compensation. Said board shall meet in Washington within 30 days after the passage of this act, and in Washington or elsewhere from time to time upon notice from the president of the board, who is to be chosen by the members thereof, or upon his own adjournments, and shall frame all rules and regulations authorized or required by this act, and shall make or cause to be made such special examinations and investigations at any place or places within the United States, or at foreign ports, as they may deem best, to aid in the execution of this act and the promotion of its objects.

§ 2 The duties of the National board of health shall be to obtain information upon all matters affecting the public health, to advise the several departments of the government, the executives of the several states, and the commissioners of the District of Columbia on all questions submitted by them, or whenever in the opinion of the board such advice may tend to the preservation and improvement of the public health.

§ 3 That the board of health, with the assistance of the Academy of science, which is hereby requested and directed to cooperate with them for that purpose, shall report to Congress at its next session a full statement of its transactions, together with a plan for a national public health organization, which plan shall be prepared after consultation with the principal sanitary organizations and sanitarians of the several states of the United States, special attention being given to the subject of quarantine, both maritime and inland, and especially as to regulations which should be established between state or local systems of quarantine and a national quarantine system.

§ 4 The sum of $50,000, or so much thereof as may be necessary, is hereby appropriated to pay the salaries and expenses of said board and carry out the purposes of this act.

Approved March 3, 1879.

The national board, immediately after its membership was completed, set about the duties required by the statute under which it was organized. **Inspectors were appointed** to visit the different **quarantine stations** and report without delay as to their condition and necessities. The action of the board met the cordial approval of the health officials of nearly every state in the Union, and its position was strengthened by further legislation in June 1879, but its usefulness as a public authority was destroyed at the end of the period during which the act was operative (four years) by the failure of congress

to make the necessary appropriations for the continuance of its work.

The board had accomplished much useful sanitary work in the **inspection of quarantine stations,** in **dealing with epidemics,** specially the outbreak of yellow fever at Memphis and New Orleans in 1879, and had undertaken and entered upon very **many scientific investigations** which gave promise of results, which, if continued, would have reflected much credit not only on the board, but on the country which maintained it. These investigations as summarized in the report of the board for 1884, under 32 separate heads, comprised subjects in nearly every department of sanitary work.

An examination of the reports of the board, together with the weekly bulletins which it published for several years, is sufficient proof of the good work accomplished during the operation of the act under which the board was constituted. The **failure of congress to continue this useful work,** and the final dissolution of the board, as a consequence, can only be regarded as a serious mistake, which should be remedied by its reestablishment upon such lines as will meet the general approval of all state and municipal authorities, with whose hearty cooperation, its own work and their own would be strengthened and made more efficient for the protection of the people.

Voluntary Health Organizations

On April 18, 1872, several gentlemen, mostly physicians, met in New York city for the purpose of considering the question of establishing a voluntary national organization for the promotion of sanitary science and the public health. This preliminary meeting was held at the New York hotel, and after deliberation, a committee was chosen to report a plan of organization at a subsequent meeting.

This meeting was held, and a **permanent organization** of the **American public health association** was effected on September 12, 1872, at Long Branch, New Jersey.

The following gentlemen were elected as its officers:

President, Dr Stephen Smith, New York.
1st Vice-President, Dr Edwin M. Snow, Providence, R. I.
2d Vice-President, Dr C. B. White, New Orleans, La.
Treasurer, Dr John H. Rauch, Chicago, Ill.
Secretary, Dr Elisha Harris, New York.

The next meetings were held at Cincinnati, Ohio, May 1, 1873, and at New York city, November 11, 1873, and from that time onward meetings have been held annually in the fall of each year in different parts of the country, in order that members from all sections might be accommodated. The meetings have usually been opened on Tuesday morning and have continued four or five days, with evening sessions, at which papers have been read and discussed relating to all subjects connected with the work of public health.

After the association had continued its work for 12 years, invitations were sent to the sanitary authorities of the British North American provinces to join it, which they did, and have formed a valuable addition to its membership. Later on, a similar invitation was sent to the states of Mexico, with the result of enlarging the scope and membership of the association still farther. The membership consists of sanitary officials of state and municipal boards of health, of delegates from the army, navy and marine hospital service, of chemists, engineers and bacteriologists, and of citizens in general who are interested in sanitary science.

It has proved to be a great public educator in matters pertaining to the health of the people, not only in the localities where its meetings have been held, but also through the medium of its published transactions, prize essays and other papers. It is not too much to say that its action has had a salutary influence in molding the work of public health at Washington.

Within the association, committees on all the prominent topics connected with public sanitation have been organized,

and have proved extremely efficient in carrying out its special lines of work. Not the least of these is the **committee on laboratories,** which was organized at a recent meeting of the association.

Another organization which is an outgrowth of this association is the **National conference of state and provincial boards of health,** which, after several preliminary meetings, was first convened at St Louis, in October 1884, the object and end of which is to secure cooperation and uniformity of methods of work among state or general boards of health. This organization at first held its meetings at the same place with the American public health association, but in later years has met at other times and places. The 13th annual report of its proceedings was published at Indianapolis, in August 1898.

The **American medical association** is a much older organization, having been formed more than half a century ago. Recently, a **section** of this association was organized for the purpose of discussing questions relating to **state medicine** and **public hygiene.** This section meets annually at the same time and place with the association, and has proved to be a very important and useful department of its special lines of work. Many of the members of the American public health association are also members of this section.

Another organization with objects closely allied to those already named is the **American climatological association,** which was organized at Washington May 3, 1884. Its first officers were Dr A. L. Loomis of New York city, *President*, Dr F. I. Knight of Boston, *1st Vice-President*, Dr W. H. Geddings of Aiken, S. C., *2d Vice-President.* The association has published an annual volume of its proceedings in each year since its organization. In addition to the foregoing, state sanitary organizations and conventions have been organized in the older states and have held meetings regularly, usually once in each quarter, for the discussion of topics relating to sanitary science. It has usually been the policy of these organizations to change the place of meeting frequently,

in order to give an opportunity to the sanitary authorities and different districts to take part in the meetings, as a matter of mutual benefit to all.

The oldest of these, the New Jersey sanitary association, had its 24th annual meeting at Lakewood, New Jersey, December 9, 1898. Similar organizations exist in Vermont, New Hampshire, Massachusetts, Pennsylvania, Michigan, Ohio, Maryland, and other states.

The Management and Control of Infectious Diseases

This department of sanitary work constitutes the **most important of all the duties,** both of general and local boards of health. So far as **state or general boards** are concerned, the functions pertaining to this branch of work consist mainly in giving advice, in investigating the causes of outbreaks of disease, and in the circulation of general information among the people in regard to the methods of preventing the spread of disease. General boards are sometimes given coordinate powers with local boards, to be used in cases of emergency.

The **local board,** on the other hand, in consequence of being (by reason of its mode of organization) in closer touch with each individual member of the community, is usually clothed with extraordinary power, for the purpose of dealing with infectious diseases whenever and wherever they are observed among the people.

The **operations of local boards** of health in this direction are enforced by the aid of laws, ordinances and rules, and the different methods employed are *first*, **notification,** *second*, **isolation** and *third*, **disinfection.** To this may be added, for the purpose of securing immunity from certain diseases, the provision of **vaccination** as a protection against the dangers of small-pox, and of certain **antitoxins** for securing immunity against other diseases, notably against diphtheria.

By far the greater use, however, of these latter products, has been of a therapeutic nature, in treating disease when actually existing in the individual. But custom has in this

case so closely associated the methods of prevention with those of treatment, as to place the distribution of such therapeutic remedies largely within the control of the sanitary authority.

Notification. Till within the past 20 years this important measure was scarcely recognized in the statutes except in the single instance of small-pox, such indefinite terms as "other contagious diseases" or, "diseases dangerous to the public health" being largely employed previous to 1880. These doubtful terms gave somewhat discretionary powers to health boards, till laws were enacted defining the diseases which were notifiable, or gave to boards of health authority to state what diseases should be notified.[1]

It is now quite generally the custom throughout all the more densely settled states, and specially in the cities and large towns, to require notification of small-pox, diphtheria (including membranous croup), scarlet fever and typhoid fever. To these may be added in a more limited degree, measles, cerebro-spinal meningitis, yellow fever (chiefly in states south of lat. 36°), leprosy, Asiatic cholera,[2] whooping-cough and German measles.

The growth of this important measure has been much more rapid in the United States in the past 10 years than in all other years preceding.

Notwithstanding the general recognition of the infectious character of tuberculosis, the propriety of requiring its notification in common with other infectious diseases, and on similar terms, does not appear to have become generally acknowledged in the United States, and the only large city in which such notification is compulsory is New York, where by the following order of the board of health of the city, such notice is called for:

§ 225 of the sanitary code, adopted January 19, 1897, classes pulmonary tuberculosis as "an infectious and communicable disease." Under the provisions of this section *physicians are*

1) In England the statutes give to districts local option in this matter except in London.
2) This disease has not occurred within the United States since 1873.

required to report to the health department the *name, address, age, sex, and occupation*, of every case of pulmonary tuberculosis coming under their professional care. *The information thus received is* SOLELY FOR REGISTRATION, *and cases so reported are not visited by the inspectors of this department, nor are they interfered with in any way, except upon the request of the attending physician.*

The residences of all cases of tuberculosis reported to this department *by public institutions* are visited by medical inspectors, who there give information with regard to the nature of the disease and the precautions necessary to prevent the infection of others. When residences occupied by consumptives are vacated through the death or removal of the patient, the inspectors recommend the renovation required to free them from infection. The orders for such renovation are enforced by the board of health.

Postal cards for the notification of cases of tuberculosis, and circulars of information for physicians and for the public, can be obtained from this department upon application.

Notification presents another advantage as **an aid to the prognosis of disease,** since by ascertaining quantitatively the amount of disease prevailing in a district, by means of a system of notification efficiently maintained, the health officer can compare the same with the mortality, and determine with a fair degree of accuracy the fatality of each disease to which the system is applied.

In consequence of inquiries sent out by the commission in 1899, information was secured in regard to **619,765 reported cases** of small-pox, typhoid fever, scarlet fever, diphtheria and measles, which occurred in the years 1894, 1895, 1896, 1897, and 1898, together with **75,715 registered deaths** from these diseases which occurred in the same years. These were reported by the following states and cities:

STATES [1]

Massachusetts .	1894–98	Vermont . .	1896–97
Michigan . .	1894–98	Connecticut .	1898
Rhode Island .	1894–98	Indiana . .	1898

1) The returns of several large cities (Boston, Worcester, Providence, Detroit, Hartford, New Haven and Indianapolis) are included in the statistics of these states.

CITIES

New York city[1]	1894–98	Reading	1894–98
Chicago	1894–98	Hudson co., N. J.	1894–98
Philadelphia	1894–98	Cincinnati	1894–97
Pittsburg	1894–98	St Louis	1894–97
Cleveland	1894–98	Baltimore	1894–97
New Orleans	1894–98	Milwaukee	1894–97
Minneapolis	1894–98	Rochester	1894–97
St Paul	1894–98	Denver	1894–96
Buffalo	1894–98	San Francisco	1898
Toledo	1894–98		

The results of the returns received from the foregoing states and cities are as follows:

Diseases	Reported cases	Registered deaths	Fatality (per cent)
Small-pox	9,222	2,385	25.8
Typhoid fever	69,758	13,284	19.0
Diphtheria and croup	195,783	44,411	22.7
Scarlet fever	127,847	9,211	7.2
Measles	217,755	6,424	2.8
Total	619,765	75,715	—

These results agree fairly well with those of the **English local government board** for the 8 years 1890–97, which showed a fatality for typhoid fever of 18.05%, for diphtheria of 23%, and for scarlet fever of 4.9%.

In the compilation of these figures it was found necessary to reject the returns of several entire states and cities, in consequence of manifest deficiency in the number of reported cases.

The **use of antitoxin for the treatment of diphtheria** became general in the early months of 1895, throughout the country. If, therefore, the returns for the year 1894 be treated separately it appears that there were 25,844 reported cases, and 7,654 deaths in that year, the fatality being 29.6%, while the fatality of the remaining years was only 21.6%.

1) Including the figures of the consolidated city for 1898.

Treating the year 1898 in the same manner, the fatality was only 20.5%, or the ratio of 31,494 cases to 6,471 deaths. In 2 states and 7 cities combined, having a total population of 4¼ millions, the fatality from diphtheria in 1894 was 29.7, and in the same places in 1898 it was only 14.6, confirming the statement that the diphtheria fatality has been cut in twain since the general introduction of antitoxin treatment. It is also quite noteworthy that in several large cities, situated a thousand miles apart, the diphtheria fatality before 1895 was quite uniformly from 29 to 30%.

Another measure which has become general throughout the country is the adoption of a regulation by local boards of health forbidding the practice of expectorating in all public places, such as public buildings, railway stations, street cars and sidewalks. The result is a much more cleanly condition of such places, and will undoubtedly have a favorable effect on the prevalence of tuberculosis.

Isolation. The practice of requiring the separation from the community at large, of persons suffering with small-pox, has been recognized for many years, and those attacked with yellow fever have been dealt with in the same manner in later years, but it has not been till the past 20 years that the laws of the states have definitely provided for the separation of those who are affected with other infectious diseases.

For the purpose of facilitating the work of isolation and of preventing the access of persons from outside the dwelling, placards or flags are commonly attached to the house in some conspicuous place, in order to notify the community of the existence of infection.

Except in the case of small-pox, it is commonly the custom to permit the wage-earners of the family to continue their occupations, under proper restrictions as to disinfection, bathing and change of clothing.

It is now commonly the practice to require the isolation, either in their own dwellings or in hospitals provided for the purpose, of persons suffering with small-pox, diphtheria and

scarlet fever, and also the exclusion from school of scholars suffering with the same diseases, and of other scholars living in the same family with pupils so suffering. Isolation is also applied to cases of measles, and also in a less rigid manner to typhoid fever and whooping-cough.

Isolation hospitals. The practice of providing special hospitals for the treatment of persons suffering with infectious diseases has not become so wide-spread in the United States as it has in Great Britain. Pest-houses and small-pox hospitals have, however, existed from quite an early period, but on account of the extremely irregular occurrence of the disease, and of the need of keeping them closed much of the time, their equipment has usually been of a primitive character.

It is only within the past 5 or 10 years that cities have begun to recognize the need of special provision for this class of diseases. At the last meeting of the American public health association, November 1, 1899, one of the speakers stated that only 15 out of the 62 largest cities in the country had yet provided such hospitals for isolation purposes.

Among the examples of these useful establishments are the Willard Parker and Reception hospitals, and the Riverside hospital of New York city, the new isolation hospital at Chicago, the South department of the City hospital at Boston, and the isolation hospitals at Paterson and at Worcester.

With reference to the isolation of persons suffering with tuberculosis, a similar want of adequate provision by public authority is manifest, but a general awakening on this subject is now taking place. Provision has been made in several states as shown by the following list, mostly by private authorities.[1]

Alabama	The Hygeia at Citronelle.
"	Convict camp for tuberculous prisoners.

1) From Dr S. A. Knopf's *Pulmonary tuberculosis and its treatment in special institutions, etc.* Philadelphia 1899.

Colorado	The Home at Denver, 4600 feet above sea level.	
"	Glockner sanitarium at Colorado Springs, 6000 feet above sea level.	
"	Colorado sanitarium at Boulder, 5300 feet above sea level.	
Illinois	Sanitarium at Chicago. Society incorporated.	
"	Cook county hospital for consumptives.	380 beds.
"	Hospital for consumptives, Chicago.	
Maryland	Hospital for consumptives, Baltimore.	
Massachusetts	Sanitarium, Sharon.	15 beds.
"	Consumptives' home, Grove Hall, Boston.	100 beds.
"	Free home for consumptives, Dorchester, Boston.	125 beds.
"	State hospital, Rutland, 1200 feet above sea level.	200 beds.
New Mexico	Sanitarium at Chico Springs.	
"	Latta sanitarium, East Las Vegas.	15 beds.
"	Ladies' home sanitarium, East Las Vegas.	16 beds.
"	St Anthony's sanitarium, East Las Vegas.	
"	U. S. government sanitarium at Fort Stanton.	
New York	Adirondack sanitarium, Saranac Lake, 1750 feet above sea.	100 beds.
"	Loomis sanitarium, Liberty, New York, 2200 feet above sea level.	80 beds.
"	Loomis hospital for consumptives, New York.	12 beds.
"	Seton Hospital, Spuyten Duyvil.	160 beds.
"	Sanitarium Gabriels, Paul Smith's.	50 beds.
"	Hill Crest, Santa Clara.	

New York	Brooklyn home for consumptives, Brooklyn.	92 beds.
"	St Joseph's hospital, New York city.	350 beds.
"	Montefiore sanitarium, Bedford.	15 beds.
"	Pasteur sanitarium, Tuxedo.	30 beds.
North Carolina	Asheville sanitarium, Asheville.	75 beds.
"	Winyah sanitarium, Asheville.	
Pennsylvania	Hospital for diseases of lungs, Chestnut hill, Philadelphia.	40 beds.
"	Hospital for diseases of lungs, 411 Spruce st., Philadelphia.	
"	Rush hospital for consumptives.	40 beds.
"	Sanitarium at Whitehaven.	
Texas	Sanitarium at White Gables.	

The legislature of New York has also appointed a commission to consider and report on the same subject, and a similar movement is on foot in Michigan.

Sir Richard Douglas Powell says of this excellent class of establishments:

> Their usefulness, however, in my judgment extends far beyond the immediate purpose for which they are proposed. Lessons in self-management are learned by those who sojourn for a time in such sanatoria; habits of self-discipline and attention to hygienic laws are acquired which are of much importance to those afflicted with consumption, and which have a favorable influence on prophylaxis; and these persons when they pass again into the general community become centres of instruction in domestic hygiene.

Disinfection. The methods employed for disinfection, after the occurrence of infectious diseases, in the United States, have been very much the same as those in use in the different countries of Europe, specially since the very important investigations of Prof Koch, upon the value of the different substances used for disinfection, were made public. Apparatus for steam disinfection has been introduced in the largest cities for the disinfection of movable material, and similar

apparatus is in use in connection with many public institutions, isolation hospitals, and also at the different quarantine stations in sea-port cities.

Within the past three years or more the use of **formaldehyde,** by means of various forms of apparatus, has very largely superseded the use of sulphurous acid for the disinfection of closed apartments.

Vaccination. **Laws relating to vaccination** were first enacted during the first decade of the century, and have been followed by various amendments and limitations from that time till the present. One of the most efficient laws relating to this subject, is that which exists in many of the states, requiring that unvaccinated children shall not be admitted to the **public schools.**[1]

While there are compulsory laws in some states, it can not be said with truth that such laws are thoroughly enforced, to the extent of securing the vaccination of the entire population over 2 years of age, as is done, for example, throughout the German empire.

The **vaccinated portion** of the inhabitants of the United States may be estimated at not far from 90% of the whole, and the re-vaccinated portion at probably 50%. But this unvaccinated contingent of 10% (usually composed of children under 5) and the larger percentage of adults who have only submitted to primary vaccination, always affords an opportunity for a rapid spread of an epidemic.

The **production of vaccine lymph,** as well as that of antitoxins, in the United States, is, unfortunately, largely in the hands of private parties, but the tendency in the past 10 years has been very decidedly in the direction of improvement, and antiseptic methods have been introduced, together with new appliances intended to secure the production of a pure and reliable lymph.

Glycerinated lymph is largely taking the place of the older forms, and humanized lymph is now but little used.

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1) See *Wood's reference handbook.* v. 7. p. 554.

Quarantine

The measures existing in the United States for **preventing** the **introduction** of **infectious diseases** from other countries into the United States, through its principal sea-ports, are provided chiefly by laws enacted by those states which are on the sea-coast, and by certain statutes of the general government which confer authority for inspection on the marine hospital service, a department of the United States treasury (act of February 15, 1893).

By this act the chief official of this department is required to examine the quarantine regulations of state and municipal boards of health, and to cooperate with these authorities in preventing the introduction of disease from abroad, as well as from one state to another (act of March 27, 1890). United States officers in foreign ports are also required to publish regulations for securing the best sanitary condition of vessels, cargoes, passengers and crews departing for the United States.

The topics which are treated in the United States quarantine regulations are:

The inspection of vessels with the passengers and crews.

Diseases quarantinable. These are cholera, yellow fever, small-pox, typhus fever and leprosy[1].

Requirements at quarantine. Nature of infected vessels; disinfection of vessels and cargoes, and of personal effects of crew and passengers; detention of passengers, and measures to be taken on the Mexican and Canadian frontiers.

It is worthy of note, with reference to **Asiatic cholera,** that notwithstanding its frequent prevalence in transatlantic countries, it has never gained a foothold in the United States since 1873, while, previous to that date, outbreaks had usually followed every great European epidemic.

The first instance on record of the enforcement of marine quarantine in the United States, was the detention of a vessel which arrived at Philadelphia, from England, in April 1728.

1) To these may now be added bubonic plague.

This ship, the Dorothy, was ordered not to come "nearer than one mile to any of the towns or ports of this province; that the master or owners do not presume to land any goods, passengers, or sailors at Philadelphia without license, under penalty," provided in an act of 1700. The sheriff was required to provide a convenient place, at a distance, for the reception of persons still sick on board, that proper care be taken for their recovery.[1]

The maintenance of an efficient **quarantine** is relatively more important in the United States, as compared with other countries, in proportion to the preponderance of the factor of immigration.

The necessity, also, of maintaining such quarantine more stringently at the present day than was required in earlier years, is due to a decided change in the quality of the immigration.

The total number of immigrants into the United States from 1820 to 1895, inclusive, was 18,480,951, and this number constituted nearly one third of the total increase of the population during the same period.

Gen. F. A. Walker in commenting on this subject, in 1896, said:

> Fifty, even 30 years ago, there was a rightful presumption regarding the average immigrant, that he was among the most enterprising, thrifty, alert, adventurous, and courageous of the community from which he came. It required no small energy, prudence, forethought, and pains to conduct the inquiries relating to his migration, to accumulate the necessary means and to find his way across the Atlantic.
>
> To-day the presumption is completely reversed. . . . So much have the rates of railroad fares and ocean passage been reduced, that it is now among the least thrifty and prosperous members of any European community that the emigration agent finds his best recruiting grounds.[2]

In the 10 years 1841–50, fully 65% of the European immigrants coming to the United States were natives of Great

1) *Proceedings* of third national quarantine and sanitary convention held at New York city, April 1859. p. 280.

2) *Atlantic Monthly*, June 1896.

Britain, but in the 10 years 1880–90 this class constituted only 31% of the whole, and those from Hungary, Russia, Poland, Armenia and Italy had greatly increased. Of the former class, arriving in 1891, not more than 8% were illiterate, while 51% of the immigrants from the southern countries of Europe, chiefly from Italy, Poland and Hungary, were illiterate. (This refers to the illiteracy of the immigrants, and not to that of the countries in general from which they came.) It is among this class, herding together in the large cities, and utterly ignorant of the methods of avoiding infection, that communicable diseases are found to spread with the greatest rapidity; and it is this class chiefly, which has brought such diseases as small-pox, cholera, typhus and bubonic plague[1] to the threshold of the United States. Fortunately, however, in most instances efficient quarantines have prevented their introduction beyond the ports of entry at which they arrived.

In most of the states on the Atlantic seaboard, the state laws give authority to the sea-port cities and towns in those states to carry out the provisions of the quarantine acts. In other states, specially those bordering on the gulf of Mexico, this authority is given to the state boards of health.

The **quarantine** and **inspection stations** which are conducted, either by national, state or local authorities are 120 in number, of which 81 are on the Atlantic coast, 22 (including Key West) are on the gulf of Mexico, and 17 are on the Pacific coast.

Several of these ports are of very little importance, in some instances no arrivals of vessels from foreign ports being reported during an entire year.

By far the most important station as a quarantine port is that of New York, since the arrivals of vessels at that station from foreign ports may be counted annually by thousands, and the number of immigrants by hundreds of thousands.

The equipment of this station consists of a boarding station, with the necessary offices for the health officer of the port

1) A ship infected with this disease arrived at the port of New York, in November last.

and his assistants, a sufficient anchorage ground for incoming vessels, two large and powerful steam-tugs for boarding facilities, apparatus and steamer for disinfection of vessels, and for bathing immigrants and disinfecting their personal effects, a detention and disinfection station on Hoffman island, an artificial island of 8 acres, having hospital buildings for the accommodation of 200 patients, a morgue and crematory, and all necessary appliances for hospital treatment of quarantinable diseases.

The following statement of the board of health of Florida, in regard to the management of maritime quarantine, appears to present a reasonable view of the matter so far as concerns the seaboard cities:

> The maritime sanitation stations operated by the state of Florida through the state board of health have each been carefully managed throughout the year in the minutest detail to prevent the introduction of epidemic contagious diseases into the state, and at the same time foster and encourage the increasing commerce and travel coming to the state from foreign ports. This has been no easy task, for it is recognized, and the fact has been emphasized repeatedly by the board and its executive officer, that the only certain protection against disease introduction is non-intercourse with infected places. The demands of trade, however, consequent upon the development of the state, have made it impossible to maintain this policy. Should an exclusive system be attempted, there will most certainly follow clandestine intercourse, and any intercourse not surrounded by rational and judicious restrictions would inevitably prove to be a source of greater danger to the lives and health of the people of Florida. By careful inspection of each vessel, and its personnel, which arrives from foreign ports, the fumigation of certain vessels, together with the disinfection of anything which may possibly act as carriers or producers of disease, and the exclusion of persons from endemic or epidemic centers, non-immune to contagious disease, the board has thought to minimize the danger of disease introduction by way of the sea, and to provide a rational and ample protective system to the people of the state. The Florida system of quarantine, or contagious epidemic disease prevention, has obtained success in preventing epidemics by promptly surrounding those cases of contagious disease which have occurred, by inspiring confidence on the part of the citizens of the state in the sufficiency of the methods followed, by discouraging all exhibitions of fear — making panics impossible — and by securing freedom of movement and uninterrupted commercial relations within the state lines.
>
> For 8 years under the operation of this system Florida has been free from epidemics of any kind, although maintaining bi-weekly communication with Havana throughout the year, and with other infected ports as well, and was enabled during the past fall when yellow fever was prevalent in neighboring states, with attendant confusion, panic and interrupted and almost entire destruction of trade, to practically exclude the disease from the state, and to maintain uninterruptedly all kinds of travel within the state lines. This freedom from excitement and from commercial and personal discomfiture has, it is believed, been appreciated by the people of Florida, being manifest in the confidence exhibited in the constituted health authorities of the state to successfully deal with the question specially delegated to them by the constitution of the state, by the various legislative enactments. . . . The quarantine fund, however large by accumulation, can not be used for domestic sanitary needs, *i.e.* internal health measures, but must be held and expended *only* for purely maritime purposes, in preventing contagious epidemic disease introduction by vessels, or through marine agencies.
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> *Ninth annual report of the state board of health of Florida.* p. 27.

Food and Drug Inspection

In a great producing country, from whose granaries and cattle regions large stores of food are annually sent abroad to other lands, the **inducements to adulterate** and to cheapen food products do not appear to be so urgent as in those more densely settled countries, where food must necessarily be imported in order to sustain the population.

It was not, therefore, till a comparatively recent period that public attention was directed to this subject. Occasional papers, giving the results of local inspections in different parts of the country, were published in the reports of state boards of health between 1870 and 1880, and in 1879 some very lively discussions were provoked on this subject, in which very exaggerated and unfounded statements were made. The old stories in relation to the presence of sand in sugar, of chalk and calves' brains in milk, and burnt liver in coffee were reproduced, and this vigorous discussion finally resulted in the offer of a **prize of $1000** by the National board of trade for the best essays on this subject, embodying a draft of a proposed law for the prevention of food adulteration. The prize was offered by an advertisement which first appeared in the columns of the Sanitary Engineer of February 1, 1880, and 3 prizes were awarded. The first prize was granted to Prof G. W. Wigner, secretary of the British society of public analysts. The bill which he proposed in this essay became the basis of most of the general food acts which were enacted in many of the states since that time.

The **first state** which took definite action on the subject was **New York,** the law having been passed June 15, 1881. That of Massachusetts followed in 1882, and several other states have enacted similar laws in the succeeding years. In New York and in Massachusetts the execution of this law was entrusted to the state boards of health, while in other states, notably in Ohio and New Jersey, it has been placed in the hands of a special food commission, clothed with similar

powers and authority. Several states also have dairy commissioners appointed to take charge of the inspection of milk and other dairy products.

In some of the states where an adequate appropriation has been made for the execution of the law, it has been enforced, and the results have been all that could be expected. Thousands of samples have been collected and examined, and many offenders have been brought to trial and convicted, while fraudulent and dishonest preparations have been driven across the border into states which have made no provision against the evil.

In 1881, Prof Wigner, the author of the food statute, in a paper on this subject used the following language:

> Adulteration does exist, it is a serious evil, and must be grappled with and effectively cured or suppressed, but exaggerated statements do not represent the real state of the food supply in any civilized country. The adulteration of the 19th century is cheating the consumer's pocket, but is not poisoning him. By all means, use every effort to prevent the fraud which does exist, but do this by fair and open statement of the real state of things, and the application of an effective remedy, instead of by manufacturing statements of poisonous admixtures that are unknown, in order to find employment for alarmist chemists and microscopists.[1]

Several attempts to secure **national legislation** on the same subject have been made, notably that of 1892, and the Brosius bill of the present year. The first of these bills, that of 1892, was ably supported by Hon A. S. Paddock of Nebraska. He presented a letter from H. W. Wiley, chemist of the department of agriculture, showing that the expense of a general system of food inspection for the country at large would not exceed $100,000 a year. The movement was ably supported by petitions from all parts of the country, but failed to pass. It is to be hoped that better success will attend the present attempts to secure similar legislation.

The following closing words of senator Paddock's argument

1) *Sanitary engineer*, May 15, 1881. p. 276.

are well worth repeating here. Speaking of the necessities of the wage-earning masses, he said:

> These, Mr President, are the men and these the women and children for whom, before all others, I make this appeal. If you could save to these the possible one third of the nutritious element of their food supplies which is extracted, to be replaced by that which is only bulk, only the form and semblance of that of which they are robbed by the dishonest manipulator and trader, you would go a long way toward solving the problem of the laboring masses whether for them it is 'better to live, or not to live,' whether it is 'better to endure the ills they have, rather than to flee to those they know not of,' that lies beyond in the realm of governmental and social upheaval and chaos.

In addition to the inspection provided by the states, the large cities also usually provide for inspection of milk and other articles of food offered for sale in their own limits.

In several of the states **dairy commissioners** have also been appointed to have charge of the execution of the laws relating to milk and milk products. Every large city in the United States also has a **milk inspector,** who is usually clothed with the necessary power to enter complaints at court against offenders. In addition to these, there are also in some of the cities special **inspectors of animals, provisions and markets,** acting either under the direction of the health department or of some other bureau.

The milk supply of New York city is obtained from 5 states, New York, New Jersey, Pennsylvania, Connecticut and Massachusetts. The daily average in 1896, being 728,612 quarts (661,580 litres) exclusive of cream and condensed milk. Over 80% of this milk is produced in New York state, nearly the entire supply being brought to the city over 9 or 10 different railway lines.

The milk supply of Boston is produced in the states of Massachusetts, Maine, New Hampshire and Vermont, the daily average supply amounting to about 240,600 quarts (218,465 litres) estimated to 1900.

The milk supply of all the large cities of the Union is subject to daily inspection by competent officials, for the purpose of preventing adulteration, and measures are being adopted

in some of the large cities to secure an improved condition of the producing dairies, both as to the health of the animals, and the conditions under which they are kept.

Meat inspection. An act of the 51st congress of the United States, dated August 30, 1890, ch. 839, provides for an inspection of meats for exportation, and prohibits the importation of certain adulterated articles of food. Its principal provisions are the following:

The inspection of salted pork and bacon intended for export, to determine whether it is wholesome, sound, and fit for human food.

Inspection to be made where the meat is packed.

Adulterated food and drugs and liquors injurious to health prohibited, and suspension of imports may be proclaimed by president.

Unjust discrimination of foreign states provided against.

Importation of diseased cattle prohibited; quarantine and slaughter of infected animals provided for.

Live animals for export to be inspected, and the diseased not allowed to go out of the country.

A later act of the same congress passed March 3, 1891, also provides for the inspection of cattle intended for export, and of those whose meat is to be exported; it also provides for inspection before slaughter, of animals intended for interstate commerce. Post mortems are also provided for.

Penalties are also imposed for forging or counterfeiting marks and tags.

The transport of unsound carcasses is forbidden.

The provisions of this law are not to apply to animals killed on the farm.

The appointment of inspectors is provided for.

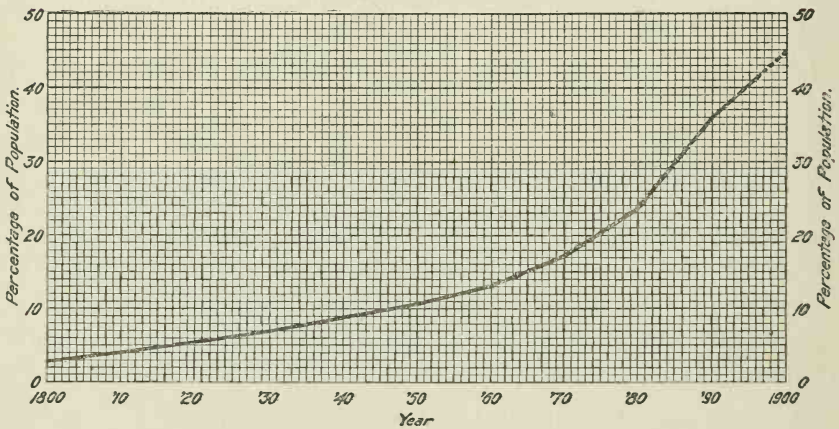
Public Water-supplies

In no department of public hygiene has more rapid progress been made, in the United States, than in the introduction of public water-supplies in cities and towns.

In the last century (the 18th) very few municipalities had taken any action toward introducing supplies of pure water for the use of the inhabitants, private wells, springs and cisterns for collecting the rainfall being the principal sources of supply. The whole number of towns supplied before 1800 was 16, of which number, 1 was in New Hampshire, 5 in Massachusetts, 1 in Rhode Island, 2 in Connecticut, 3 in New York, 1 in New Jersey, 1 in Pennsylvania and 2 in Virginia.

None had been introduced in states south of Virginia or west of Pennsylvania. All of these 16 supplies furnished water to towns containing less than 150,000 inhabitants, or about 2.8% of the existing population at the beginning of the century.

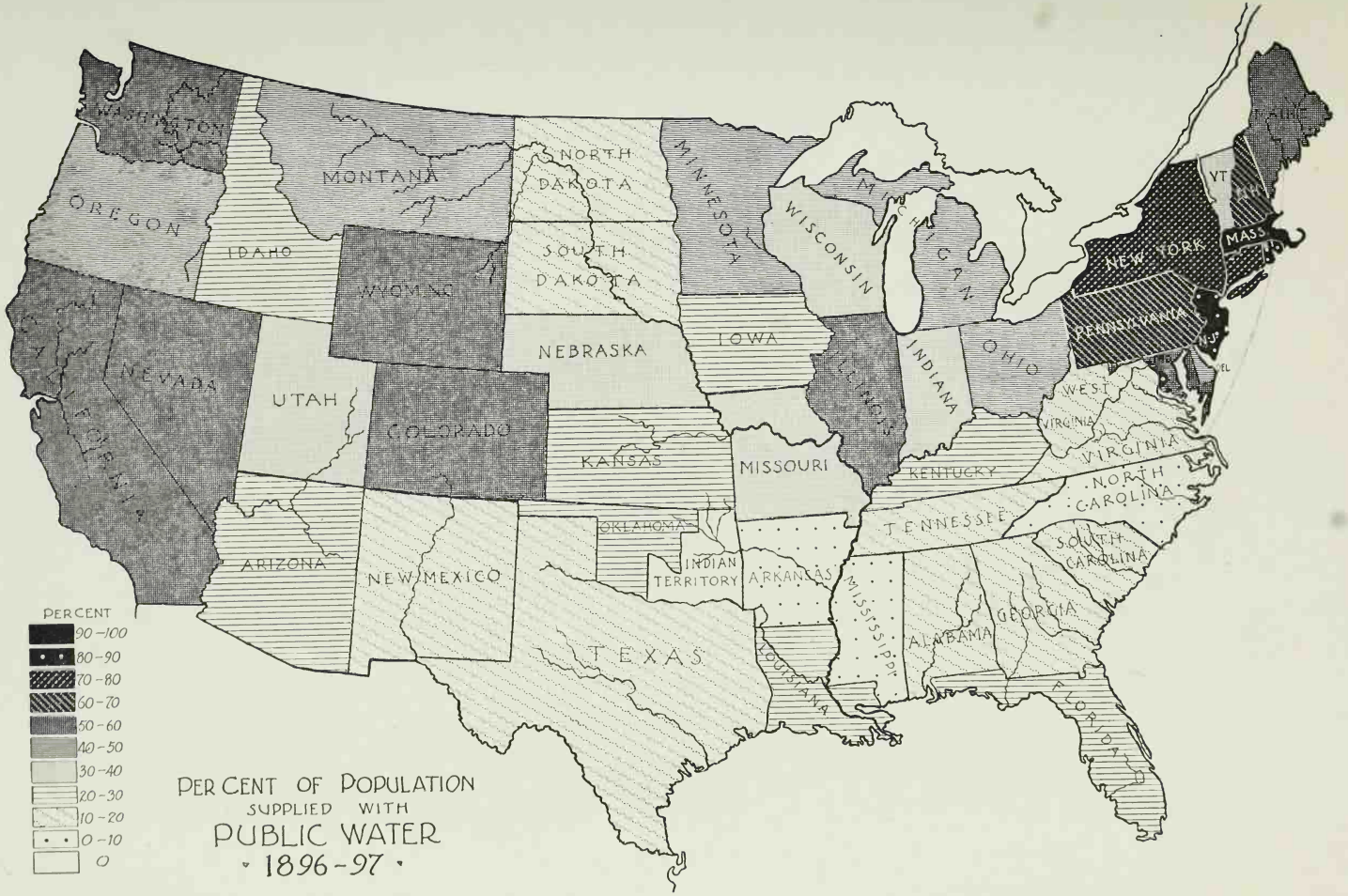
DIAGRAM SHOWING THE PERCENTAGE OF POPULATION IN THE UNITED STATES LIVING IN TOWNS SUPPLIED WITH PUBLIC WATER.



The dotted line (1896–1900) indicates the probable increase to the close of the century.

In 1850, 50 years later, only 83 public water-supplies had been introduced, supplying cities having a population of about 2,450,000, or 10.6% of the total by the census enumeration of that year. In 1860 the population supplied was only 13% of the total, in 1870, 17%, and in 1880 it was 11,809,000, or 23.5%. In 1890 the total number of supplies had increased to 2074, and the population supplied was 22,470,000, or

WASHINGTON
OREGON
CALIFORNIA
IDAHO
NEVADA
MONTANA
WYOMING
UTAH
COLORADO
ARIZONA
NEW MEXICO
NORTH DAKOTA
SOUTH DAKOTA
NEBRASKA
KANSAS
OKLAHOMA
INDIAN TERRITORY
TEXAS
MINNESOTA
IOWA
MISSOURI
ARKANSAS
LOUISIANA
WISCONSIN
ILLINOIS
MICHIGAN
INDIANA
OHIO
KENTUCKY
TENNESSEE
MISSISSIPPI
ALABAMA
GEORGIA
FLORIDA
SOUTH CAROLINA
NORTH CAROLINA
VIRGINIA
WEST VIRGINIA
PENNSYLVANIA
NEW YORK
MAINE
VT.
N.H.
MASS.
CONN.
R.I.
N.J.
MD.
DEL.
PERCENT
90–100
80–90
70–80
60–70
50–60
40–50
30–40
20–30
10–20
0–10
0
PER CENT OF POPULATION
SUPPLIED WITH
PUBLIC WATER
1860


WASHINGTON
OREGON
CALIFORNIA
IDAHO
NEVADA
MONTANA
WYOMING
UTAH
COLORADO
ARIZONA
NEW MEXICO
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NEW YORK
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MASS
N.J.
FL
PERCENT
90–100
80–90
70–80
60–70
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40–50
30–40
20–30
10–20
0–10
0
PER CENT OF POPULATION
SUPPLIED WITH
PUBLIC WATER
• 1896–97 •

35.9%. In 1896, according to the Manual of American water works (last edition 1897), the number had increased to 3196, and since, in many instances, a single plant furnished water to several municipalities, the total number of cities and towns thus furnished, either partially or wholly with public water-supplies, was 3942, the population of these places (by the census of 1890) being 41.6% of the population of that year. The rapid increase of this important work in some of the states is marvelous. Only 5 cities west of the Mississippi river were furnished with public water-supplies before 1860, but in 1896 there were 1011 cities and towns having public water-supplies west of the Mississippi, and many more were in contemplation. In the 2 states of Nebraska and Kansas alone there were only two existing public water-supplies previous to 1880, while 180 have been introduced in the same states since 1880, most of them being in towns of less than 3000 inhabitants.

During the last quarter of a century, several very **extensive schemes** for supplying water to large populations have been inaugurated. Among them may be named the extension of the water system of New York city, by the enlargement of its tributary water-shed, and the construction of the Croton dam, with the Croton lake and the Jerome park reservoirs. The enlargement and improvement of the Chicago water-works, by the extension of the water intake to a distance of 4 miles into Lake Michigan, this scheme having become necessary in consequence of the increasing pollution of the water-supply by the drainage of the city. A new supply was also planned for the metropolitan district about Boston, and is in process of construction. This scheme will afford an ample supply for a population of about 2 millions when completed, and is capable of further expansion.

Greater attention has also been given during the past 20 years to the subject of **water purification**, and measures have been undertaken, and in some instances completed in several cities, for the purification of their water-supplies by means of

filtration. Among these special mention may be made of the city of Lawrence, Mass., which had for about 20 years drawn its supply directly from a river which was polluted by the sewage of several hundred thousand inhabitants living above the intake of the water-works. **Typhoid fever** had increased in the city to alarming proportions. But after the introduction of the filtration system, the **death-rate** from this disease was **reduced to less than one tenth** of its former size, and has continued to diminish from the year after such introduction of the new filtering plant. Similar measures are being taken in other American cities.

The following table presents the statistics showing the growth of public water-supplies in the United States during the past century:

GROWTH OF THE WATER-WORKS IN THE UNITED STATES

Compiled from the Manual of American water works

(Edition of 1897)

Years	No. of supplies introduced	Years	No. of supplies introduced
Before 1800	16	1890	207
1800–1809	11	1891	161
1810–1819	7	1892	182
1820–1829	11	1893	201
1830–1839	20	1894	259
1840–1849	26	1895	302
1850–1859	51	1896 and part of 1897	293
1860–1869	99		
1870–1879	358		
1880–1889	1268		

The following table presents by groups the percentage of the population supplied with public water in each of the states in the Union in 1860 and in 1896:

PER CENT OF POPULATION SUPPLIED WITH PUBLIC WATER IN 1860 AND 1896–1897

1860

District of Columbia	81.4	80 to 90 %
0		40 to 80 %
New York	34.7	30 to 40 %
Maryland	31.3	
Rhode Island	29.0	20 to 30 %
Pennsylvania	27.0	
New Jersey	26.8	
Massachusetts	24.3	
Louisiana	23.8	
Connecticut	22.7	
California	20.1	
Delaware	18.9	10 to 20 %
Missouri	13.6	
Ohio	9.6	0 to 10 %
New Hampshire	6.7	
Illinois	6.4	
Kentucky	6.2	
Michigan	6.1	
West Virginia	4.7	
Virginia	4.4	
Georgia	3.3	
Tennessee	1.7	
Vermont	1.4	
Maine	1.2	
Indiana	0.7	
Alabama	0.4	
Arizona		0 %
Arkansas		
Colorado		
Florida		
Idaho		
Iowa		
Kansas		
Minnesota		
Mississippi		
Montana		
Nebraska		
Nevada		
New Mexico		
North Carolina		
North Dakota		
Oklahoma		
Oregon		
South Carolina		
South Dakota		
Texas		
Utah		
Washington		
Wisconsin		
Wyoming		

1896–97

Massachusetts	90.3	90 to 100 %
Rhode Island	89.7	80 to 90 %
District of Columbia	88.2	
New Jersey	82.0	
Connecticut	73.5	70 to 80 %
New York	72.3	
New Hampshire	66.1	60 to 70 %
Pennsylvania	66.0	
California	57.7	50 to 60 %
Colorado	57.0	
Wyoming	55.5	
Nevada	52.6	
Maine	52.1	
Washington	50.6	
Illinois	50.3	
Maryland	50.1	
Delaware	46.4	40 to 50 %
Ohio	42.9	
Michigan	41.8	
Minnesota	41.0	
Montana	40.2	
Oregon	40.2	
Utah	39.8	30 to 40 %
Vermont	39.3	
Wisconsin	36.7	
Nebraska	35.9	
Missouri	32.6	
Indiana	30.5	
Arizona	26.6	20 to 30 %
Oklahoma	26.6	
Louisiana	26.3	
Kansas	24.3	
Iowa	24.1	
Florida	22.3	
Idaho	22.2	
Kentucky	21.5	
Texas	19.8	10 to 20 %
Virginia	18.9	
New Mexico	17.4	
South Dakota	16.4	
Georgia	15.6	
Tennessee	15.2	
West Virginia	13.5	
North Dakota	12.5	
Alabama	11.5	
South Carolina	10.6	
Arkansas	7.7	0 to 10 %
North Carolina	7.6	
Mississippi	6.3	

The charts between pages 36 and 37 also illustrate the same groups in a graphic manner.

See also the statistical table in appendix I, columns 7 and 8.

Sewerage and Sewage Disposal

Closely related to the subject of water-supply is that of **sewerage** and **sewage disposal,** since the sewage consists of the water of the public water-supply, with the addition of such household filth and manufacturing wastes as may be added to it by the population. Both are sanitary necessities of great importance, but the public water-supply is usually introduced long before serious thought is given to the question of sewerage. It is for this reason that the percentage of the population living in sewered towns is very much less than that of the towns furnished with public water-supplies.

The **percentage of people living in sewered towns** in the United States in 1896 was 28.7[1], while the percentage of the total population living in towns having public water-supplies was 41.6.[2] The number of cities and towns which had introduced systems of sewerage[3] in 1896 was 822, or less than one fourth of the total number of cities and towns furnished with public water-supplies.

The **methods of disposal** are various, and are necessarily

1) This figure is probably incorrect for the following reasons: the essential information for an authoritative statement on this subject was compiled from the manual of American water-works, this being the only work in which such information could be found with a fair degree of completeness. The information in that work was obtained by means of circulars issued to the authorities having the water-works throughout the country in charge, and may be relied on as accurate so far as water-supplies are concerned, but that which applies to sewers was obtained from the same water officials. In very many municipalities the water-supplies and sewerage systems are under the control of separate authorities. Hence, information obtained from one department relating to another department can not be considered as accurate as that which it provides relating to its own affairs.

In two states it was found possible to correct the percentage given in the table, by means of lists existing in those states. For example, in Massachusetts, the addition of towns and cities having sewers, not mentioned in the manual, increases the percentage from 63.3 to 73.5, and in New Jersey from 63.6 also to 73.5. It therefore seems probable that from 5 to 10 %, or more, may reasonably be added to the figures given for each of the states in the table on page 43. We have preferred to present in the table only such figures as could be compiled from published statements, without attempting to give approximate estimates.

2) See chart facing page 43, and table on the same page for further details.

3) The term "system of sewerage" is here intended to apply to those systems which collect household sewage, but not to those which are constructed to receive storm water only.

dependent upon the conditions and circumstances which prevail in each case.

In the case of **cities situated on the sea-coast,** or in large bays, harbors or tidal estuaries, the sewage is usually discharged into sea-water without treatment. This is the method pursued at Portland, Salem, Lynn, Gloucester, Boston, Providence, New York, Baltimore, Charleston, Savannah and San Francisco. The greater portion of the sewage of Boston is retained and only allowed to discharge on each outgoing tide, while that of the remainder of the city and of 14 neighboring cities and towns is discharged into deeper water continuously.

Most large cities situated upon the great lakes and rivers discharge their sewage directly into those bodies of water, as at Philadelphia, Cincinnati, St Louis, Albany, Minneapolis, St Paul, Washington, Buffalo, Detroit, Richmond, Chicago, Milwaukee and Cleveland. In some instances, these bodies of water are the sources of water-supply of cities, and are liable in consequence of their proximity, either at lower points on the same stream or at some point near the outlet of sewers on lakes or ponds, to be seriously polluted. It was this condition which has caused serious epidemics of typhoid fever at Chicago, Philadelphia, Lowell, Lawrence, Newburyport and other cities, in some of which radical changes in the methods and sources of supplying water have been introduced as a consequence.

Disposal upon land has been conducted with entirely satisfactory results in several cities and towns, but the number of such places is not large.

Chemical precipitation is also conducted in a few places, the most notable instance being the city of Worcester, having a population of about 100,000. The sewage of this city had, till 1890, been discharged without treatment into a tributary of the Blackstone river, to the annoyance of towns situated below the city. By an act of 1886, the city was required to remove its sewage from the river within four years, and the precipitation method was therefore adopted.

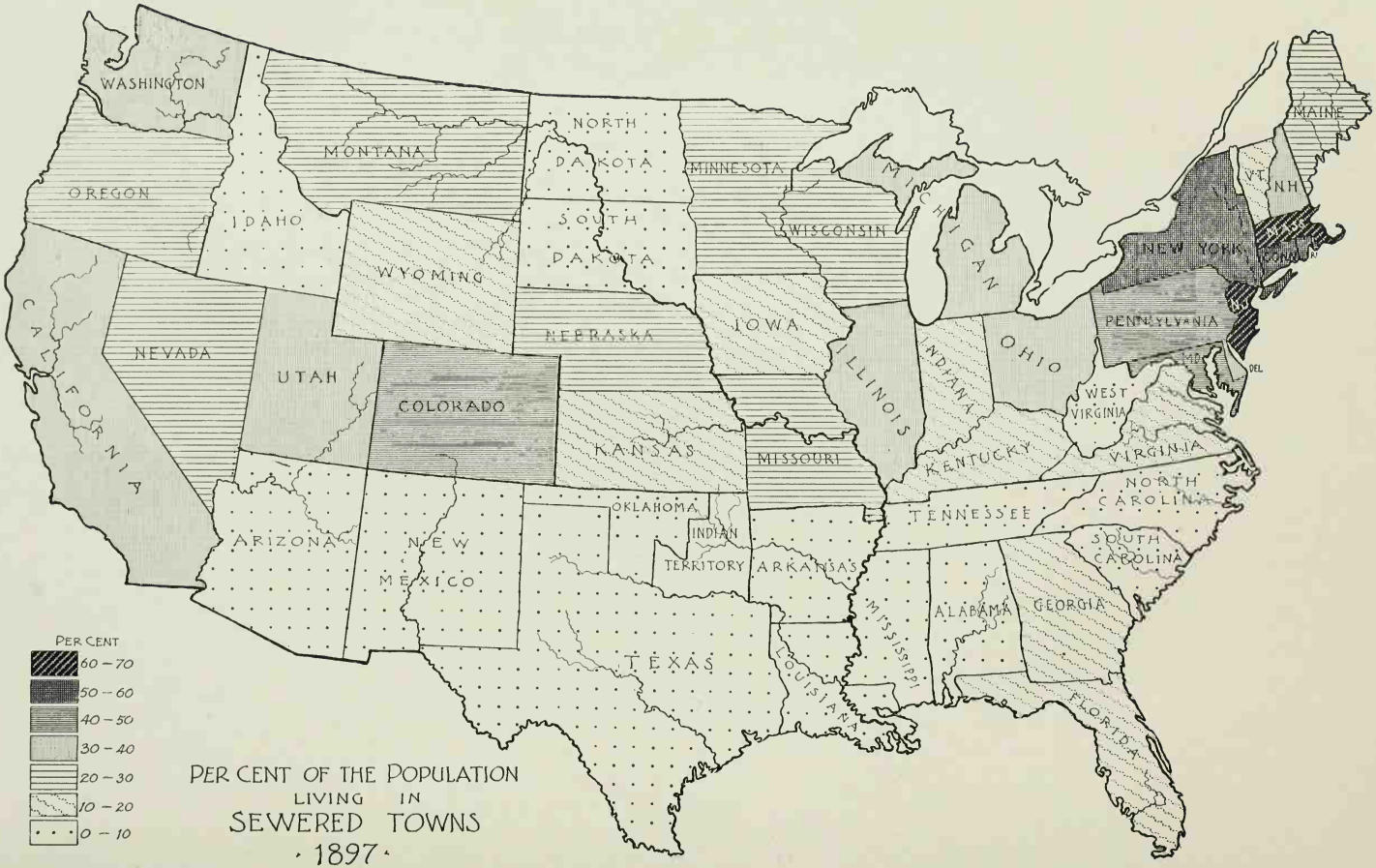
One of the most extensive schemes for sewage disposal, in the United States, is that which is **now being completed at Chicago,** having for its object the entire removal of the city sewage from lake Michigan, and its transfer to the Illinois river and thence to the Mississippi, so that the sewage which formerly passed into the lake and thence went to the gulf of St Lawrence, now finally reaches tide-water at the gulf of Mexico.

This **great drainage canal** serves 2 important purposes. It provides an outlet for the sewage of the city, and at the same time furnishes a water-way from Lake Michigan to the Mississippi river. This extensive undertaking was an absolute necessity. The city received its water-supply from the lake, and at the same time emptied nine tenths of its drainage into the same lake. Temporary measures for relieving this condition were adopted, by extending the intake of the water-works to a distance of 4 miles from the shore, with the effect of reducing the death-rate from typhoid fever appreciably. But even this distance was insufficient, and the death-rate from this cause has again risen.

Work upon the great canal (28 miles in length) was begun in 1892, pursuant to an act of the Illinois legislature of 1889, and the work is now rapidly approaching completion. When finished, the entire sewage of Chicago, diluted with the water of Lake Michigan, will be discharged through this canal.

One of the **most useful statutes** yet enacted, with reference to the subject of **water-supply** and **sewerage,** was that which was passed by the Massachusetts legislature in 1886, entitled an "Act to protect the purity of inland waters." The annual appropriation specially provided for carrying out the provisions of this act, in recent years, has been $30,000. Since the operations of the state board of health under this act have been a matter of frequent comment in medical, sanitary and engineering journals, the writer takes the liberty of quoting the statute in full in appendix III.

Under this act it will be seen that the duties of the board



PER CENT OF THE POPULATION
LIVING IN
SEWERED TOWNS
· 1897 ·

are chiefly to examine, to advise and to report, and in cases of omission to comply with the laws in regard to pollution of water-supplies and inland waters, the board is authorized to inform the attorney-general.

Under its provisions the board has been enabled to maintain a careful supervision over the systems of water-supply throughout the state, has given its official advice to municipal authorities, corporations and individuals in 660[1] instances, has established and maintained an experiment station, for the purpose of carrying out experiments in sewage purification and water filtration, and has examined many samples of water, sewage, sand, gravel and other soils, chemically, bacterially and mechanically, during the period in which the act has been in operation. The advantages derived from the operation of this act are generally acknowledged, both among the citizens of the state and elsewhere.

PER CENT OF THE POPULATION LIVING IN SEWERED TOWNS
(1896–97)

States			States		
New Jersey	63.7	60 to 70 %	Wyoming	19.3	
Massachusetts	63.3		Indiana	17.9	
			Vermont	17.1	
New York	58.8		Florida	13.4	
Rhode Island	56.0	50 to 60 %	Kentucky	12.5	10 to 20 %
Connecticut	52.7		Iowa	11.8	
			Kansas	11.4	
Colorado	43.2		Virginia	10.9	
Maryland	42.6	40 to 50 %	Georgia	10.2	
Pennsylvania	40.9				
			Texas	8.4	
New Hampshire	39.1		Tennessee	8.1	
California	39.1		Alabama	7.5	
Delaware	38.3		Oklahoma	7.4	
Illinois	38.0	30 to 40 %	West Virginia	6.2	
Ohio	32.6		Idaho	6.1	
Washington	32.1		South Carolina	5.5	
Michigan	30.1		Arizona	5.3	0 to 10 %
Utah	30.1		North Dakota	4.5	
			New Mexico	3.6	
Minnesota	28.0		South Dakota	3.1	
Nevada	27.6		Arkansas	2.2	
Maine	26.3		North Carolina	1.6	
Oregon	26.0	20 to 30 %	Mississippi	1.0	
Wisconsin	25.8		Louisiana	1.0	
Missouri	24.9				
Montana	23.1				
Nebraska	22.6				

1) To the close of 1899.

School Hygiene, Subjective and Objective

That which relates to the **health and comfort of the pupil** personally, and that which pertains to **his surroundings.** The number of children enrolled in schools in the United States in 1890, was 14,219,571 (U. S. census) and at the present date, January 1900, is probably about seventeen or eighteen millions. The majority of these is subjected to the influences attendant upon school life throughout several years of the adolescent, or rapidly growing period of life, an age when one's surroundings have a greater influence on his health, and consequently on his future condition, and to some extent on his length of life, than they do at later ages.

The **first schoolhouses** in the country were small, one-story, one-room buildings, with such ventilation as open fire-places furnished. Little or no regard was had for the important question of lighting, cubic air space, adaptation of seats to the ages of pupils, typography of school-books, or to the usual sanitary conveniences now considered as essential features of every well appointed schoolhouse. When open fire-places gave place to cast iron stoves heated with firewood, the conditions were even worse, for the only avenue for efficient ventilation, the fire-place, was then closed.

The transition from these structures (which are still in use in many rural districts) to the large **modern structures** having many schoolrooms, accommodating several hundred scholars in each, and provided with modern sanitary appliances, has been gradual, and has been brought about by the demands of the people, and by the frequent investigations of state and local boards of health, as well as by voluntary organizations of citizens interested in the public welfare.

Laws have also been enacted in several states, placing the sanitary supervision of schoolhouses under the control of definite authorities empowered to act, and to make or to cause to be made, such changes as are necessary to place these buildings in proper sanitary condition. In some states this

authority has been granted to boards of health, in others to the school authorities, and in others still to special state or district police officials.

On the other hand the pupil, considered subjectively, has received less attention than has been given to his environment. Not till the past 20 years have laws been enacted providing for the protection of the family and the community at large, from the influence of aggregating children together in close proximity, at an age when the susceptibility to infection is at its maximum.[1]

The question of deciding whether particular scholars should be excluded from school, or whether the school should be closed altogether in case of an unusual prevalence of infectious disease, has usually been left to the discretion of the local authorities, but sometimes the latter procedure has been adopted only when endorsed or recommended by a state or central authority.

Physical training has in recent years been introduced in the schools of all large cities, and the tendency is to place this important branch in the hands of educated instructors. Unfortunately, military training, with its narrow methods of physical culture, has for a time, in many places, been allowed to supplant broader and more rational methods in the higher grades of schools. Time will undoubtedly provide the remedy for this error.

Medical inspection of schools. The plan of making **regular medical inspections** of the pupils attending the public schools, so far as the United States is concerned, was introduced by a communication from the board of health of Boston to the mayor and city council, in 1892. An appropriation was made, but the plan was not put in operation till November 1894, when a corps of 50 physicians was appointed for as many districts in the city. These inspectors were instructed "to visit the schools daily in the morning, and to examine all

1) An exception may be made to this statement in the single instance of the law existing in some states, providing for the exclusion of unvaccinated children from school, a measure which dates from a considerably earlier period.

pupils who complain, or appear to the teachers to be ill." If scholars were found showing symptoms of infectious disease, or were otherwise too ill to remain in school, the teacher was advised to send the pupil home. In the examination of throats, wooden tongue depressors are used, to be destroyed after each single examination.

These inspectors are also authorized to visit the homes of children thus found to be ill, and to see that proper precautions are taken at home for preventing the spread of disease.

During the 14 months, ended December 31, 1895, 16,790 pupils were examined, 10,337 of whom were found to be ill, and of these 77 had diphtheria, 28 scarlet fever, 116 measles, 28 chicken-pox, 69 pediculosis, 47 scabies, 47 mumps, 33 whooping-cough and 8 congenital syphilis. The remainder were suffering from a variety of other diseases, and many of them were found to be too ill to remain in school during the day.

A similar plan was adopted in New York city in March 1897, and measures have been recommended for its adoption in Chicago, Philadelphia, St Louis, Washington, Worcester, Fall River, Lowell, Brookline and Newton.[1]

Municipal Hygiene

The necessity of **public sanitation,** judiciously administered by some well-organized municipal authority, increases in proportion to the increase in density of the population. Hence every city and nearly every large town of 10,000 inhabitants or more, in the United States, now has its board of health, or health department, organized for the purpose of providing for the protection of the public health of the citizens living within the limits of such municipality.

For the smaller towns, villages and rural districts, which comprise at present the greater part of the population of the United States, the laws are much more variable.

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1) *Report of U. S. commissioner of education*, advance sheets. Washington, D. C., 1899. p. 1489–1511.

The board of health or health commissioners of cities are usually appointed by the city government, while those of the towns are more commonly elected by the people, in the same manner with other important local officers.

The principal duties of municipal boards of health are the following:

The management and control of infectious diseases, including notification, isolation, disinfection, vaccination, and the supervision of infectious disease hospitals.

The inspection and abatement of local nuisances.

The sanitary inspection of the food supply, and specially that of milk, provisions, and animals used for food.

Street cleaning.

The collection and disposal of ashes, garbage and refuse.

Tenement-house inspection.

Medical inspection of schools.

Supervision of foundlings, infant asylums and lying-in hospitals.

Inspection of plumbing.

Inspection of bakeries.

Inspection of barber-shops.

Registration of vital statistics, and supervision of burials.

Care of public bathing establishments.

Regulation of offensive trades.

Regulation of stables.

Supervision of the municipal water-supply, and the system of sewerage and sewage disposal.

Some of the foregoing topics have already received separate consideration in this monograph, and some of them are also frequently referred to special commissioners, acting independently of boards of health. This is usually the case with the city water-supply and the systems of sewerage.

Quite frequently, also, the cleaning of streets, and the collection of refuse is done by a special independent authority, and sometimes two or more of these functions are vested in a board of public works.

Local nuisances. The **inspection** and **abatement** of those **unsanitary conditions** which are liable to prove detrimental to the health, comfort and convenience of the citizens of any municipality, are among the chief duties of every local board of health.

For this purpose arbitrary power is usually entrusted to municipal boards of health, for the purpose of enabling them to deal promptly and decisively with local nuisances.

The following language of a judge of supreme court fitly expresses the duty of the local board of health in such matters:

> Their action is intended to be prompt and summary. They are clothed with extraordinary powers for the protection of the community from noxious influences affecting life and health; and it is important that their proceedings should be delayed as little as possible. Delay might defeat all beneficial results; and the necessity of the case, and the importance of the public interests at stake, justify prompt action.

Offensive trades. Certain **trades** which are more or less **productive of noxious and offensive odors,** and hence are unusually annoying and injurious to persons living in the neighborhood, are often placed under the supervision of local boards of health by special laws. Slaughter-houses, rendering works, artificial fertilizer works, glue factories, tripe-boiling establishments and chemical works, constitute the principal works of this kind. If the local board of health neglects or refuses to apply the proper remedy in such cases, it occasionally becomes necessary for some other authority to act, either the state board of health, or a court of law.

It was on account of the serious nuisance caused in a rapidly growing district near Boston, by the business of slaughtering animals in private establishments, without regard to sanitary precautions, that a law was enacted in 1871, which gave authority to the state board of health to close such establishments, when the "public health, or the public comfort and convenience" required. Complaints were made against 23 of these places, the result of which was the formation of a corporation for the purchase of land and erection of

an abbattoir, in which the business of slaughtering was conducted upon improved methods, and a large district was relieved of the public nuisance.

Street cleaning. The systematic **cleaning of the streets** and public places of cities is a subject of comparatively recent growth in the cities of the United States. The methods of administration, the appliances used, and the results accomplished, have undergone very decided changes in the line of improvement, and even to the casual observer visiting almost any large city after the lapse of 10 years or more, a great improvement is manifest.

A conspicuous example of thorough and extensive work of this character was that of the late Col Geo. E. Waring, who was appointed to administer this important department in the city of New York in 1895, and in a brief period wrought a radical improvement in the condition of the streets.[1]

Disposal of refuse. The duty of providing for the **collection and disposal of the garbage,** ashes, waste-paper and domestic rubbish of cities is usually, though not always, performed by the department of street cleaning. To find a satisfactory method of collecting this material, of providing for its proper separation by the householder, and of its final disposal, is often a serious and perplexing question. Clean ashes are employed for the filling of new made land, but when mixed with putrescible garbage, as often happens, they must necessarily become a nuisance to the neighboring inhabitants. Garbage, when fed to swine and other animals, is a frequent cause of disease, as is abundantly shown by thorough investigation.

Hence, in some of the states, laws have been enacted restricting this practice.

In sea-port cities, it has been a common custom to tow such material out to sea, in barges so constructed as to admit of easily discharging their contents.

In some inland cities such material has frequently been

1) *Street cleaning and the disposal of a city's wastes,* by Geo. E. Waring, Jr. New York, 1899.

treated by burying or by digging it in the soil, a method which necessitated the accumulation of offensive deposits during the winter.

In many cities it has been the custom to treat the perishable material either by destruction with fire, or by some process intended to utilize the products obtained, either by means of steam or by naphtha, the resulting products usually consisting of fats and fertilizers. For this purpose inventive genius has supplied many forms of destructors and rendering apparatus.

Public baths. Public bathing establishments have existed for many years in the principal sea-coast cities, and cities on the banks of large rivers, where open air and summer bathing is practicable. But all-the-year-round bath-houses under municipal control, in which hot and cold baths can be had at any time, either free or on payment of a very small fee, are yet but few in number, except in the largest cities. As an exception to this statement, may be mentioned the bath-house recently erected in the town of Brookline, Mass., which is a model in its way, and is furnished with all the necessary appliances for hot and cold bathing, swimming tanks, and opportunities for instructing the pupils of public schools, as well as others, in the art of swimming.

Plumbing inspection. Within a comparatively recent period, the business of **plumbing** and **drainage of houses** has been entrusted to the supervision of the local board of health, by the enactment of laws providing both for the registration, licensing and examination of plumbers, and the inspection of their work.

The action of these laws has wrought a very great change from the unsatisfactory conditions which had formerly prevailed.

Bakeries. In some states provision has been made by law for regular inspection of bakeries by local boards of health.

Tenement-house hygiene and inspection. The number of American cities in which the population has become so densely aggregated as to call for special measures to remedy the evils

attendant upon tenement-house life, is not large. By the census of 1890 there were only 11 cities in the United States having a population of more than 250,000 in each, but the rapid increase of the population in these cities, in recent years, has produced conditions in some of them, which approach those of Glasgow and London, and hence, measures for their relief are demanded. By an act of the legislature of New York of 1894, a tenement-house committee was appointed to investigate the tenement-houses of New York city. The report of this committee states that eight fifteenths, or a little more than one half of the population of New York city at that time, lived in "what are generally called tenement-houses, rather than apartment houses".[1]

The **death-rate of the infant population** in these dwellings is much greater than that of children living in single houses. One of the chief causes of the higher death-rate is the existence of old and unsanitary buildings. In 1892, the Bureau of labor statistics of Massachusetts reported on the tenement-houses of Boston, and found that 67% of the population lived in rented tenements. The **chief defects** of these tenement-houses is the want of air, light and ventilation in the rooms, and their general uncleanly condition. The number of sleeping-rooms having no outside windows was 3657. The reasons given for the occupation of such quarters were chiefly intemperance, low rent, poverty, choice, necessity and nearness to work.

More than 120,000 of the population of Glasgow live in one-room tenements, and 264,000 in two-room tenements.[2] Such conditions do not exist in any American city, even though the density of the population in certain limited areas in New York city exceeds that of the most densely populated parts of London.

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1) The commission defines a "tenement-house", as meaning "every house, building, or portion thereof, which is rented, leased, let, or hired out to be occupied, or is occupied as the house, home, or residence of three or more families, living independently of one another, and doing their cooking on the premises, or by more than two families upon a floor so living, and cooking, but having a common right in the halls, stairways, yards and water-closets, or some of them."

2) *Life in one room*, by Dr Russell, medical officer of health of Glasgow.

For the relief of these evils, different methods have been adopted: 1) cleaning of tenements, and attempting to reform the habits of the occupants; 2) erecting model tenements; 3) municipal purchase of bad districts, destruction of buildings and erection of new and better ones; 4) inducing the removal of families to the suburbs, or to become owners of their dwellings.

Following the example of Miss Octavia Hill of London, who began her work in 1864, several philanthropic ladies (Miss Collins of New York, Mrs Lincoln of Boston, and Miss Wright of Philadelphia) have carried out similar work in these cities, by improving conditions already existing. In addition to this work, voluntary organizations have been formed, for the purpose of erecting model dwellings after the plan inaugurated by Mr Geo. Peabody in London.

The Improved dwellings association of New York, the New York tenement-house building company, the Commission of public works and the Astral apartments association of Brooklyn, together with several other corporations and individuals, by organized effort, have accomplished much in the way of erecting model dwellings for the poor.

Municipal purchase of areas, with destruction of unsanitary buildings and the erection of better houses, has not yet been undertaken by city governments in America.

In New England, several manufacturing corporations have made commendable efforts to induce their employees to purchase their own homes. It has also been the custom, even from the first half of the present century, for many manufacturing corporations to provide and to rent tenements to their operatives.[1]

The **Cooperative savings bank and building system** has also proved successful, specially in Philadelphia, and more recently throughout other parts of the Union, in furnishing the funds for building houses for artizans, mechanics and others.

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1) See description of the mill tenement-houses of Lawrence. *Report of sanitary commission of Mass.*, 1850. p. 442–446.

One of the most recent factors which is now indirectly effecting an improvement in this direction, is the introduction of **electric street railways** connecting cities with their suburbs, and thus constituting a rapid, easy and economical method of reaching more sparsely settled districts, a blessing for wage-earners, who were formerly compelled to live in the crowded sections of cities.

The following figures present some of the conditions of life in the cities, with reference to this subject. The table brings out in sharp contrast some of the conditions prevailing in New York city and Philadelphia, since in New York city over 82% of the families live in houses having more than 3 or 4 families, while in Philadelphia only 4.9% live under the same conditions, and 84.6% of the families have each a house of their own.

POPULATION, FAMILIES, DWELLINGS AND AREA, IN LARGEST CITIES OF THE UNITED STATES[1]

Cities having over 250,000 in each

CITIES	Population 1890	Families	Dwellings	Area in sq. miles	Population per sq. mile	Average number persons to dwelling	Average number families to dwelling	Families in dwellings		
								Having 1 family	Having 3 families and over	Having 10 families and over
								Per cent	Per cent	Per cent
New York	1 515 301	312 766	81 828	40 22	37 675	18.52	3.82	12.02	82.08	38.60
Chicago	1 099 850	220 320	127 871	160 57	6 850	8.60	1.72	35.04	38.80	.86
Philadelphia	1 046 964	205 135	187 052	129 39	8 092	5.60	1.10	84.64	4.90	.07
Brooklyn[2]	806 343	170 970	82 282	26 46	30 474	9.80	2.08	24.64	53.03	1.77
St Louis	451 770	91 756	60 937	61 35	7 364	7.41	1.51	44.46	23.47	1.20
Boston	448 477	89 716	52 669	35 28	12 712	8.52	1.70	34.63	37.46	1.75
Baltimore	434 439	86 654	71 112	28 38	15 308	6.02	1.20	69.53	7.52	.07
San Francisco	298 997	52 535	47 183	15 46	19 340	6.34	1.11	82.65	6.42	.35
Cincinnati	296 908	63 530	33 487	25 00	11 876	8.87	1.90	31.96	48.49	2.67
Cleveland	261 353	53 052	43 835	24 88	10 505	5.96	1.21	69.33	8.88	.55
Buffalo	255 664	51 461	37 290	39 04	6 549	6.86	1.38	54.05	20.11	.57

1) From *Encyclopedia of social reform*. New York, 1897.

2) Now consolidated with New York city.

The **duty of the local board of health,** in regard to the tenement-house population, is a very important one, since the board of health has the legal authority to act in a summary manner when the occasion demands it. In most, if not all the cities of the United States, the sanitary authorities have well-organized departments for the purpose of tenement-house inspection, with authority to cause dwellings to be put in proper sanitary condition, and when this is not practicable, to order them to be vacated, and in some instances to be destroyed.[1] Following the Scotch practice, the system of ticketing apartments[2] and limiting the number of occupants and the cubic air-space to each one, has also been adopted in some American cities.

In the city of New York the tenement-house inspector is required to ascertain the following facts:[3]

Street number
Name and address of owner
Number of families
Number of occupants
Overcrowding
Halls, if lighted
Privy accommodations — number of sittings
Whether separately and independently connected with sewer
Rags
Schools
Housekeeper on premises
Cellars, if clean and dry
Cellars, if fit for human habitation
Yards, whether properly graded
Yards, whether sewer connected
Front and rear areas, whether graded
Front and rear areas, whether sewer connected
Waste-pipes, whether trapped
Waste-pipes, whether joints are connected with cement or lead
Waste-pipes, whether ventilated 2 feet above the roof
Soil-pipes, whether trapped
Soil-pipes, whether joints are connected with cement or lead
Stairs and balusters throughout the house
Walls and ceilings of halls and rooms throughout the house
Floors of rooms and halls throughout the house

1) Acts of Massachusetts. April 1, 1897.

2) The Ticketed House of Glasgow. President's address before the Philosophical society of Glasgow. J. B. Russell, M.D., LL.D. November 1888.

3) From *annual report of board of health*, New York, 1876.

Slop-sinks, whether trapped and ventilated
Wash-basins, whether trapped and trap ventilated
Bath-tubs, whether trapped and trap ventilated
Water-supply pipes
Roof
Skylights and roof ventilation
Leaders
Eaves-gutters
Chimneys
Fire-escapes, whether encumbered
House-drain, whether defective or earthenware
Water-closets, whether trapped and trap-ventilated
Privy-vaults
School-sinks
Privy-houses
Cesspools
Urinals, whether properly flushed
Fences
Hydrants in yard
Air-shafts
Ash and garbage receptacles, whether suitable, sufficient and clean
Ash and garbage receptacles, whether kept within the stop-line

The inspections of this class of houses made by the board in 1896, were 190,134, resulting in 38,858 complaints on which orders were issued. In addition to the foregoing, 45,601 night inspections were made to prevent overcrowding. Three hundred twenty-two houses were ordered to be vacated. This course is taken where the owners refuse to comply with orders, and in the majority of cases notices are complied with before the order of vacation takes effect.

At the beginning of the present century, public health in the sense now accorded to the term, could hardly be said to exist, since public sanitation is one of the necessities dependent very largely on the close aggregation of the population, and at that period there were scarcely a half dozen cities in the new republic which contained in each a population of more than 10,000 people, and not one having 100,000.

By an act of the legislature of New York, of February 10, 1797, entitled, an act "to prevent the bringing in and spreading of infectious diseases in this state," a board of health was created for the city of New York, with power to make rules and orders.[1]

1) *Report of Metropolitan board of health*, 1866. History of health laws. p. 366.

By acts of the legislature of Massachusetts, boards of health were created for the towns of Boston and Salem in 1799, and similar action was soon afterward taken for the protection of other towns. The board of health of New Orleans was created by an act of the legislature in 1818. The board of health of Philadelphia was incorporated in 1806, that of St Louis was established September 2, 1843. But for the period embracing the early half of the century, little information can be gained in regard to the operations of such boards, other than the duty of preventing the spread of small-pox.

Industrial Hygiene

A very large proportion of the population of the United States is engaged in useful occupations, the total number of such employed persons amounting to many millions. By the census of 1880, there were engaged in all occupations, including agriculture, manufacturing, mining and commerce, 17,392,099 persons, and in 1890 these had increased to 22,735,661. Some of these occupations or industries, and specially those which are conducted indoors, have a decided effect on the health of those who are employed. The special industries in which operatives are subjected to harmful influences are mining, cotton and woolen manufacture, paper-making (specially in the department of rag-sorting and cutting), stone-cutting, grinding and polishing of steel implements, match-making, wool and hair-sorting and hide-cleaning, the manufacture of poisonous colors and dyes, pottery and all manufactures into which lead enters as a component part (painting, plumbing, type-setting, glazing, etc.). To these may be added certain industries and occupations in which the employed are specially liable to serious accidents involving the loss of life, limb or sight. But little organized work has been accomplished thus far in America in this important direction, other than that which has been provided for by the enactment of certain laws requiring factory inspection by special officials appointed for the purpose.

The chief danger in these occupations is that which results from the inhalation of dust, either of an irritating character, as in the case of file-cutting and needle-grinding, or of a specific, poisonous nature, such as is illustrated by the dust of infected foreign hides and hair, and that of the floors of workshops infected with the expectoration of tuberculous workmen.

Efficient ventilation constitutes one of the best means of preventing the occurrence of the diseases to which workmen are subject. To this may be added the frequent cleansing of floors of workshops, the provision of cuspidors properly supplyed with disinfectants, and regulations prohibiting expectoration upon floors, and elsewhere.

Legislation is very much needed providing for a careful investigation of the conditions to which operatives are subjected in harmful employments, the causes of the evils, and the best means of applying the proper remedy.

Arsenical products. The manufacture of different arsenical products has produced more or less injury among workmen, specially in those establishments where paris green is made in large quantities, for use in agricultural districts in the destruction of the various insect pests.

The use of arsenic in the manufacture of wall-paper and textile fabrics has been greatly diminished, in consequence of the popular demand for goods which are free from this dangerous poison. In several states, legislative inquiries relating to this subject have taken place, and bills for the restriction of this use of arsenic have been introduced, but thus far manufacturing interests have succeeded in preventing their enactment.

Burial of the Dead

In the early history of the British colonies, in North America, burials were made in small grave-yards or cemeteries, usually in the villages or quite near them, and in most of the larger and older cities these places still remain. But in these large cities, burials in such places have been discontinued, either in consequence of overcrowding, or of local

ordinances forbidding their further use. In a few instances, burials were made **beneath churches** in the older cities, but this objectionable practice has almost entirely ceased, and at the present time, larger cemeteries have been established at considerable distances from the densely settled portions of large cities. These are carefully laid out and enclosed, and in many instances, the sculptor's art has contributed much to their adornment. The annual custom of visiting and **decorating the graves** of dead soldiers of the wars, in all parts of the United States, has undoubtedly contributed toward making cemeteries more attractive and beautiful.

So far as concerns the question of public health, very decided progress has been made in the United States. Laws relating to the **transportation of the dead** have been enacted, requiring special care in the case of transportation of those who have died of infectious disease. Laws have also been enacted providing for the **licensing** of **undertakers** and embalmers, and ordinances to prevent the holding of public funerals in case of deaths from certain infectious diseases, and forbidding intramural burials.

The average annual intramural interments per acre, in 1890[1], were as follows for the principal cities. They varied very greatly from a maximum of 43.4 per acre in Jersey city to 0.97 in Dayton, Ohio.

	Per acre	Per hectare
New York city	4.3	10.6
Chicago	7.8	19.3
Philadelphia	15.6	38.5
Brooklyn	12.3	30.4
St Louis	8.8	21.7
Boston	16.3	40.3
Baltimore	13.3	32.9
San Francisco	17.9	44.2
Cleveland	22.9	56.6
Buffalo	4.1	10.1

1) From *U. S. census of 1890*, social statistics of cities.

Embalming. Within the past 10 years, through the zeal of undertakers and others having charge of funeral rights, the practice of embalming the dead has spread in the United States with greater rapidity than is demanded by the people. In not a few instances has it seriously interfered with the action of justice, in determining the cause of death in cases of violence, and in some states laws have been enacted providing for the restriction of the practice.

In the United States, as elsewhere, the false pride and sentiment which too often attends the burial of the dead, leads to the impoverishment of families, and large sums are expended in the burial of those who in their lifetime lacked the necessities of life.

Cremation. Within the past 20 years the custom of cremating the bodies of the dead has obtained a considerable foothold in the United States, and several crematories have been built in different parts of the country.

The first crematory was built by Dr Julius T. Le Moyne at Washington, Pa., in 1876, and was used for the disposal of his own remains. From that time to the present much has been written in America in relation to this safe and rational method of disposal. No more establishments for incineration were erected till 1884, but from 1884 to the present time 26 crematories have been established. In some instances, laws have been enacted favoring the practice and placing it under proper restrictions.

That the public sentiment in favor of incineration is steadily increasing, is shown by the rapidly augmenting number of bodies submitted to this method of disposal.

The following list furnished by Mr Louis Lange of New York city shows the rapid progress which has been made in the establishment of crematories in the United States, and in the number of persons whose remains have been incinerated in these since their introduction in 1876.

In the 8 years 1876–1883, only 25 bodies had been disposed of in this manner, and all of these were treated in the

crematory built by Dr Le Moyne at Washington, Pa. From that time the annual number increased to 1699 in 1898, with a total of 8885 in all, up to the close of 1898, and by the date of opening of the Paris exposition of 1900, the number will probably have reached about 10,000.

DIAGRAM SHOWING THE
NUMBER OF CREMATIONS PER ANNUM
IN THE UNITED STATES

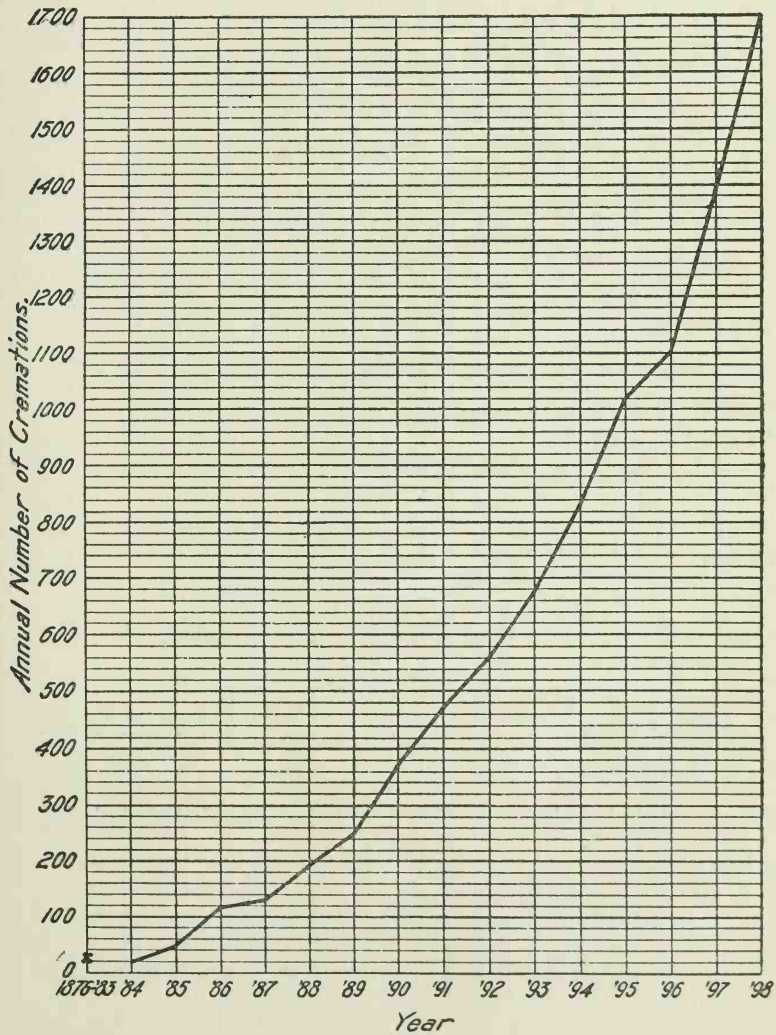

TABLE OF CREMATIONS IN THE UNITED STATES, 1876 TO 1898

CREMATORIES		Date of establishment	1876 1883	1884	1885	1886	1887	1888	1889	1890	1891	1892	1893	1894	1895	1896	1897	1898	Totals
New York city (U. S. Cremation Co.)	State of N. Y.	1885	–	–	9	77	67	83	106	160	187	186	232	243	296	330	331	466	2773
Buffalo		1885	–	–	1	8	17	16	23	30	38	27	30	31	41	28	44	40	374
Troy		1890	–	–	–	–	–	–	–	4	10	14	15	12	10	18	14	13	110
Swinburne Island		1889	–	–	–	–	–	–	–	2	–	60	28	8	1	1	3	3	106
Waterville		1893	–	–	–	–	–	–	–	–	–	–	1	1	6	5	4	4	21
St Louis, Mo.		1888	–	–	–	–	–	21	20	42	60	64	72	87	96	86	118	109	778
Philadelphia, Pa.		1888	–	–	–	–	–	14	28	31	51	62	68	74	88	85	78	114	693
San Francisco, Cal. (Odd Fellows')		1895	–	–	–	–	–	–	–	–	–	–	–	–	66	101	214	260	641
Boston, Mass.		1893	–	–	–	–	–	–	–	–	–	–	1	87	88	135	160	167	638
Cincinnati, Ohio		1887	–	–	–	–	11	21	34	45	43	34	42	38	66	46	71	59	510
San Francisco, Cal. (Cypress Lawn)		1893	–	–	–	–	–	–	–	–	–	–	42	111	88	70	54	65	430
Chicago, Ill.		1893	–	–	–	–	–	–	–	–	–	–	6	42	66	54	82	130	380
Los Angeles, Cal.		1887	–	–	–	–	7	5	12	17	29	41	37	38	37	37	34	58	352
Detroit, Mich.		1887	–	–	–	–	3	10	14	24	21	33	47	22	31	29	44	51	329
Pittsburgh, Pa.		1886	–	–	–	14	9	11	8	9	13	14	13	10	13	14	16	23	167
Baltimore, Md.		1889	–	–	–	–	–	–	3	5	12	16	22	15	11	17	21	14	136
Lancaster, Pa.		1884	–	3	36	14	13	6	1	3	1	3	5	2	1	1	1	2	92
Davenport, Iowa		1891	–	–	–	–	–	–	–	–	6	7	13	8	8	9	23	17	91
Milwaukee, Wis.		1895	–	–	–	–	–	–	–	–	–	–	–	–	–	21	34	30	85
Washington, D. C.		1896	–	–	–	–	–	–	–	–	–	–	–	–	–	–	25	38	63
Pasadena, Cal.		1895	–	–	–	–	–	–	–	–	–	–	–	–	4	14	13	24	55
Washington, Pa.		1876	25	13	1	1	–	–	–	–	–	–	–	2	–	–	–	–	42
St Paul, Minn.		1897	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	11	13
Fort Wayne, Ind.		1895	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5	1	6
Middletown, Conn. (Asylum)		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Mt Auburn, Mass. (Cambridge)		1899	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Totals			25	16	47	114	127	190	249	372	471	561	674	831	1017	1101	1391	1699	8885

Legal provision has been made in some states, providing special means for carrying out the laws in regard to death certificates, in regard to bodies presented for incineration, and providing that in case of death by violence, the body shall not be embalmed before it is seen by an official medical officer (medical examiner or coroner).

Railway Hygiene

The rapid development of the different railway systems in the United States in the last half century[1] has made it imperative that measures should be taken to protect the patrons of these roads from the dangers incident to public travel. One of the chief difficulties which hinders the progress of this important branch of public hygiene, consists in the fact that the long, through lines of travel extending across the continent, pass across very many different states, each one of which is, in a measure, a law unto itself, and it is no easy matter to secure uniformity of legislation on this subject among the different states. At the present time, almost the only legislation on this subject is that which exists in a few states in relation to the transportation of dead bodies, and specially regarding the bodies of those who have died of infectious diseases. Yet, it is a matter of certainty that a living, breathing human being, sick with an infectious disease, is a far greater danger to persons in his immediate proximity, than the body of one who has died of the same disease, and is enclosed in a coffin. This coffin is also carried in a baggage or freight car, apart from the passengers, and is almost invariably enclosed in an outer box when prepared for transportation. It therefore follows, that legislation intended for the protection of the traveler from the sick and living is of far

1) The mileage of the railways of the United States, in 1898, was 185,371, or 6.28 linear miles of railway for each 100 square miles of territory, and 25.6 miles for each 10,000 of the population.

The number of passengers carried 1 mile, in 1898, was 13,379,930,004, and the total number of passengers carried was 501,066,681. (*Report of interstate commerce commission*, 1898.)

Further information in regard to the railway suburban travel may be found in appendix 4.

more importance than that which is designed to protect him from the dead.

An investigation made in Massachusetts with reference to certain infectious diseases, in 1891, showed that small-pox, diphtheria, scarlet fever and measles were relatively more prevalent in the towns situated on railway lines than they were in those towns not so connected. Out of 2298 deaths from small-pox which occurred in 20 years in the state, only 13 occurred in towns not directly on some line of railway communication. The same fact was noted, though in a less marked degree, in regard to diphtheria, scarlet fever and measles. Undoubtedly, many unrecognized cases of infectious disease travel on railways, hence, measures are necessary to provide, **first,** for the thorough cleansing and disinfection of cars and their furnishings, specially of sleeping-cars, at the ends of their respective routes or lines of travel; **second,** for a careful supervision of the water-closets on the trains, and that they are not allowed to be used at, or near the stations in cities and towns. It is quite practicable, also, and desirable, to require that some disinfectant of recognized potency be added to the water used for flushing purposes, when such is provided; **third,** the water-supply, the food-supply, and the ice-supply used on long lines for dining and lunch-cars and at stations, should receive careful supervision. It is also desirable that the milk used on dining-cars and at stations should be procured of stated parties, and they should be held responsible for its quality and for the cleanliness of the dairies from which it is obtained; **fourth,** measures are necessary for the exclusion of persons sick with infectious diseases, from public conveyances (cars and steamers), and if this is impracticable, to provide for their isolation in separate cars or compartments.

Decided improvement is already taking place along these lines. Railway corporations find it for their own advantage to provide such protection as is necessary, and are gradually furnishing sanitary appliances, either in advance of, or in con-

sequence of compulsory legislation. Railway hygiene has been a frequent topic of discussion, in recent years, at the meetings of the American public health association, and also of the railway surgeons and medical directors of the different railway systems. The latter formed an organization at Chicago, November 9, 1894, under the name of the "American academy of railway surgeons", and have published an annual volume of transactions since that date.

Vital Statistics

One of the chief objects of mortality returns and reports is the collection and preparation of materials ultimately to be handed over to those who are presumed to be competent, by virtue of their professional education, to deal with questions of public hygiene and sanitation. The statistics accumulated each year by the registrar and his clerks, are destined, in the natural course of events, to serve as a basis for the sanitary operations of the board of health; for the accomplishment of this purpose it is indispensable that they should first be submitted to the investigations of the hygienist. Unless so utilized, these statistics can be but a dead letter, and must remain practically valueless. They contain little more than the bald statement of disease and death. From this statement to recognize the causes of excessive and undue mortality, and the degree of its preventability, and to deduce suitable prophylactic measures, is a task which physicians only can be considered competent to undertake.[1]

The United States, as a whole, can not be said to have a system of vital statistics, regularly conducted, such as exists in many older countries. The sole attempts which have been made to collect the vital statistics of the country at large, have been those which constituted a part of the work of the United States census in its enumeration of the years 1860, 1870, 1880 and 1890. Much credit is due to Dr John S. Billings, U. S. A., for the intelligent supervision which he gave to that branch of the work. The volumes of mortality statistics which were compiled under his direction are extremely valuable, as showing the principal data referring to mortality for the census years in which the facts were collected.

1) *Second annual report of the board of health of Boston*, 1874. Paper by Dr F. W. Draper. p. 73.

No inquiry made at the end of the year, for which the data are desired, so far as vital statistics are concerned, can be considered as complete or reliable, and Dr Billings estimates that the returns obtained by the census enumerators did not exceed 60 or 70% of the actual number of deaths. He further says:

> Our census affords the only opportunity of obtaining even an approximate estimate of the birth and death rates of much the larger part of the country, which is entirely unprovided with any satisfactory system of state and municipal registration.

It remains a fact, therefore, that only a minor fraction of the states have thus far adopted and carried out a system of regular collection and publication of their vital statistics. The states which have maintained a fairly complete system for several years are the following:

Maine beginning with 1892
New Hampshire beginning with 1880
Vermont beginning with 1857
Massachusetts beginning with 1842
Rhode Island beginning with 1853
Connecticut beginning with 1848
New York beginning with 1893[1]
New Jersey beginning with 1878
Delaware beginning with 1881
Michigan beginning with 1897

In addition to the foregoing there has also been a partially complete collection of marriages, births and deaths for several years, in Michigan, Minnesota, Indiana, Kentucky and Alabama. In Michigan, under the recent energetic supervision of Dr Wilbur, the registration has been very much improved, and now includes the returns from nearly every district in the state.

The existence of registration laws, enforced quite thoroughly in recent years in the 6 New England states, renders it possible to present the accompanying table of the principal vital statistics of these states for the 5 years 1893–97. For the sake of economy in space, the aggregates of the 5 years and the mean rates of the period only are presented.

1) From *Public health laws*, New York. ch. 661.

PRINCIPAL VITAL STATISTICS OF THE SIX NEW ENGLAND STATES

(For the five years 1893-97)

Mean annual population of the period (estimated)	Maine 667,248		New Hampshire 392,256		Vermont 332,493		Massachusetts 2,501,406		Rhode Island 392,569		Connecticut 817,215		Total (New England) 5,103,187	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Marriages and rate per 1,000 population	28 025	8.40	19 794	10 09	13 881	8.35	113 224	9.05	16 776	8.55	32 089	7.85	223 789	8.77
Living births and rate per 1,000 population	71 733	21.50	41 353	21.09	34 876	20.98	348 021	27.83	50 656	25.82	98 097	24.00	644 736	25.27
Deaths and rate per 1,000 population	54 472	16.33	35 308	18.00	27 888	16.77	240 215	19.21	36 749	18.72	72 086	17.64	466 718	18.29
Deaths under one year and rate per 1,000 births	8 463	117.90	6 052	146.30	4 723	135.40	54 969	158.50	8 447	166.50	14 700	149.80	97 354	151.00
Deaths from Consumption, and rate per 10,000 population	6 056	18.15	3 520	17.95	2 552	15.35	27 443	21.94	3 849	19.61	6 607	16.17	50 027	19.70
Deaths from Pneumonia, and rate per 10,000 population	4 695	14.07	3 164	16.13	2 651	15.95	23 751	18.99	3 430	17.48	6 517	15.95	44 208	17.32
Deaths from Typhoid Fever, and rate per 10,000 population	1 111	3.33	586	2.99	477	2.87	3 508	2.80	593	3.02	1 142	2.79	7 417	2.91
Deaths from Small-pox, and rate per 10,000 population	0	0	0	0	1	0.006	46	0.04	2	1.01	22	0.05	71	0.03
Deaths from Measles, and rate per 10,000 population	138	0.41	88	0.45	104	0.63	786	0.62	254	1.29	436	1.07	1 806	0.71
Deaths from Scarlet Fever, and rate per 10,000 population	205	0.61	228	1.16	200	1.20	2 533	2.03	505	2.57	497	1.22	4 168	1.63
Deaths from Diphtheria and Croup, and rate per 10,000 population	938	2.81	630	3.21	627	3.77	8 082	6.46	1 226	6.25	2 138	5.23	13 641	5.35
Deaths from Cholera Infantum, and rate per 10,000 population	2 546	7.63	1 946	9.92	933	5.61	12 945	10.35	2 569	1 3.09	3 302	8.08	24 241	9.50
Deaths from Cancer, and rate per 10,000 population	2 368	7.10	1 319	6.73	991	5.96	8 387	6.71	1 133	5.77	2 264	5.54	16 462	6.45

The chief points shown by these figures are the higher birth and death-rates in the 3 more densely settled states of Massachusetts, Rhode Island and Connecticut; slightly lower death-rates from typhoid fever in these states than in the 3 northerly states (a mean death-rate for this disease of 2.83 per 10,000 living, in Massachusetts, Rhode Island and Connecticut, as compared with 3.12 in the 3 other states), and much higher death-rates from diphtheria and cholera infantum in the 3 densely settled states than in the 3 other states.

The mean density of population of the 3 states of Maine, New Hampshire and Vermont at the time of the census of 1890, was 28.5 per square mile, while that of the 3 southern states of the group was 238.4, or more than 8 times as great.[1]

By a careful estimate, derived from the census year 1880, and by comparison with the more accurate returns of the large cities, Dr Billings came to the conclusion that the death-rate of the United States, in 1880, was very close to 18 per 1000 living inhabitants. He also concluded that the birth-rate was 36 per 1000, or twice the death-rate. The death-rate of the New England states, taken together, has averaged about 19 per 1000 for the past 25 years. That of the older middle states about 17 or 18, while that of the more newly settled western states has probably been as low as 13 or 14 per 1000, since in these states there is a predominance of inhabitants at the healthy ages of life.[2]

On several of the wing-frames in the hygiene section of the exposition, will be found some diagrams which present the death-rates of the registration states in different years, together with the death-rates from different diseases, mostly of the infectious class. In some instances the latter are represented as a percentage of the mortality from all causes. This

1) The figures in this table may be compared with those presented for the previous year (1892) in "*a summary of the vital statistics of the New England states*," published by the secretaries of those states. This summary contains further information as to the distribution by sexes, ages and nativity, and the statistics of the principal cities and larger towns. P. S. King & Son, London, Eng., and Damrell & Upham, Boston, Mass.

2) The death-rate of persons aged from 10 to 30 years, is from 6 to 7 per 1000 annually, consequently, a newly settled district having a preponderance of persons at those ages, will have a lower death-rate than an older district in which the relative number of aged persons is greater.

method was adopted in states and cities having imperfect registration, in consequence of the impossibility of presenting an accurate showing by the former method.

On the whole, the registration of vital statistics is progressing in the United States, but not as rapidly as might be wished. Considerable impetus has been given to the discussion of the subject, by the frequent presentation of papers at the meetings of the American public health association and the American statistical association. The importance of the subject as a foundation for our accurate knowledge in matters pertaining to public health, can not be overestimated. Those states, in fact, which have made the most commendable progress in preventive medicine are also the states which have brought their systems of registration to the highest degree of perfection.

By far the best general presentation of the vital statistics of the United States is that which may be found in the volumes of the United States census of 1880 and 1890, including the special volumes devoted to the vital statistics of certain large cities. The reports of 5 of the New England states, with those of Michigan and Minnesota, are published in separate volumes, while those of New York, New Jersey, Connecticut, and several other states, are incorporated in the annual reports of the state boards of health. Within the past year much improvement has also taken place in the registration of Indiana, in consequence of the exertions of its state board of health.

Classification. The question of the classification of diseases has assumed increased importance, in recent years, in consequence of the rapid progress of medicine. The system in general use for nearly half a century in the registration states and chief cities of the United states, has been that of Dr Farr, and has served a useful purpose. This system, however, is now shown to be far behind the present demands of medical progress, and improved methods are urgently called for.

The principal substitute for the older systems now offered and also now accepted and adopted by a considerable number

of authorities throughout the world, national, state and municipal, is that of Dr Bertillon of Paris.

This system was brought to public notice in the United States, in a paper by Dr Bertillon, presented at a meeting of the International statistical institute, at the Columbian exposition at Chicago, in August 1893, and was later on the subject of discussion at the meeting of the American public health association, at the same place, in October 1893.

Subsequently, the committee on vital statistics of the same association, after a full discussion of the subject, reported in its favor, and their recommendation was endorsed by the association in October 1898.[1] This committee, through the commendable activity of its secretary, Dr Wilbur, has accomplished much toward the introduction of the system in several of the registration states and in some of the larger cities. A very full and complete presentation of the system, with minor details and adaptations to an American population, is printed in the monthly bulletin of vital statistics of Michigan, beginning with February 1898.

Rural Hygiene

In the United States, the population occupying the rural districts is still largely in the majority, and probably amounts to nearly 50 millions.

(By the census of 1890 the rural population was estimated at 71% of the whole, or about 44 millions.)

There must necessarily be a large ratio of the population engaged in the pursuits of agriculture, since the broad prairies and other agricultural lands of this large territory furnish food, not only for the domestic population, but also send ample supplies every year to feed the inhabitants of other countries.

The preservation of the health of this portion of the population is a matter of quite as much importance as that which relates to the dwellers in cities; and while it is true that the average length of life of the farmer is greater than

1) See *Transactions American public health association*, 1898. p. 311.

that of people engaged in other occupations, it might undoubtedly be lengthened by closer attention to sanitary principles. There are few occupations in which hygiene is more neglected. The farmer pleads that he can not afford to take measures for ventilating, warming or draining his house. On the contrary, he can not afford not to take these precautions.

Much improvement has actually taken place in those states and districts where an awakening of the people to the need of better modes of living has been brought about by various means, either through the occurrence of such epidemics as neglect and carelessness often produce, or through active missionary work of a sanitary nature. In the following directions there is room for much improvement in the sanitary conditions of the rural population.

The conditions referred to are: 1) A good location of the home, having a sunny exposure, with dry soil and freedom from dampness. 2) A well-planned house, adapted to the wants of its inmates. 3) Thorough drainage and disposal of the household wastes, so that neither harm, nor annoyance to others can take place. 4) A pure water-supply; this is a point of special importance in the case of dairy farms, since the farmer is then a distributor of food to populations living at a distance, and it oftens happens that a polluted water-supply at the dairy causes an epidemic of disease among the consumers of the milk when this water is used for washing cans and cooling the milk.

Another defect in the hygiene of the rural population of the United States is that of badly selected or badly cooked food. Notwithstanding the great abundance and variety of food, both animal and vegetable, which is produced on the well-tilled farms of New England and on the western prairies and fertile fields of the south, it is undoubtedly true that the food of the farmer is less varied and less wholesome than that of the urban population.

In the more densely settled states it often happens that the

better and the more nutritious products of the farm (eggs, and the products of the dairy) are sent to the markets of the neighboring cities, while the farmer's family is fed on a limited and less nutritious diet. The chief defects of the diet of the rural population may be stated as follows:

Too exclusive use of fried food.

Salt meat, to the exclusion of fresh meat.

Exclusive use of fine wheat flour in the place of the coarser and more wholesome sorts of meal and flour which were largely in use a half century since.

Pork in some form is used as food by a very large part of the population of temperate climates, and when it is the product of healthy animals it is a nutritious and wholesome food for all who are accustomed to a life of toil, and for those who have naturally vigorous constitutions.

Swine, however, are subject to many diseases, some of which, specially those of a parasitic nature, are communicable to man.

It has been observed that those animals which were fed on the offal and garbage of cities were infected in a much greater degree than those which were fed on wholesome food.

It is only a few months since the writer was called to investigate 2 outbreaks of trichinosis, in which more than 50 persons were taken ill and 5 died. The disease is almost unknown among persons of American birth, since the latter invariably use pork thoroughly cooked, while the eating of raw pork is quite a common practice among those of foreign birth, specially among Germans.

Tape-worm, also, usually has its origin in eating the flesh of swine which has been insufficiently cooked.

The government provides an ample force of inspectors at the principal pork-packing places, for the purpose of securing protection to the consumers of this pork in other countries to which it is exported. But the agriculturist himself, who produces the pork upon his farm, has no protection for his family who may be consumers of the same, except that which

common sense at once suggests — the thorough cooking of the meat. This applies with greater force to those farms which are near great cities, to which the offal of these cities is often hauled for the purpose of being fed to swine. Investigators have shown that this class of animals is much more liable to trichinosis than those which are fed on the healthful food raised upon a farm — meal, grain, potatoes and other vegetable foods.

The proper ventilation of sleeping-rooms is another matter of importance, and one which is usually neglected.

The Climate of the United States in its Relation to Health

In a country which extends almost from the tropic of cancer in the south to Point Barrow in northern Alaska, several hundred miles beyond the Arctic circle, and from Eastport, Maine, in longitude 67° west, to the extremity of the Aleutian islands, at a point beyond 160° west, the range in all the factors which make up the somewhat indefinite term **"climate"** must necessarily be great.

That climate has a decided influence on the health of a given population is a well established fact.

Yellow fever is a disease, for example, which rarely prevails north of latitude 35°, in the United States, and even when it once appears north of 35° it is easily prevented from spreading, but in the gulf states the greatest vigilance on the part of the sanitary authorities is necessary, both to prevent its introduction and to suppress it when once introduced.

Pneumonia, in the United States, appears to destroy more lives in the high and mountainous districts than it does along the low lands of the sea-coast, while the opposite may be said of **phthisis,** which attacks the dwellers in low and damp districts more severely than those who inhabit the drier table-lands of the interior. **Diphtheria** is more prevalent in the colder, northern portions of the United States than in the south, and **malarial fever** is more prevalent in the south and

southwest. These facts are vividly shown in Dr Billing's maps in the United States census volumes of 1880 and 1890 on vital statistics.

The different factors which constitute climate — temperature, humidity, wind, rainfall, cloudiness and atmospheric pressure, have a varying effect upon health, the two first being probably the most important.

The disease with reference to which the greatest share of attention has been paid, so far as its relation to climate is concerned, is consumption, and many different parts of the country have been selected as places in which to establish resorts or sanitaria where this disease may be successfully treated, largely on account of the favorable influence of the environment which the local climate affords. New England, and particularly its sea-coast region, is ill adapted for persons of consumptive tendency, but health resorts for such persons have been established in the Adirondack regions of northern New York, in the higher Appalachian districts of North and South Carolina, in the high lands of the Rocky mountain slopes of Colorado and New Mexico, and in southern California.

The death-rate from consumption in New Mexico is less than that of any other part of the United States. The semi-tropical and insular position of Florida, also give to it a reputation as a favorable resort throughout the winter for those who desire to escape from the more rigorous climate of the northern states at that season.

The sea-coast from Cape Cod southward affords excellent facilities for sea-bathing throughout the summer months, and on the Florida and gulf coasts throughout the year. North of Cape Cod the temperature of the water in summer is from 10° to 15° (5° to 8°C) colder than it is on the south side of the Cape. That of Vineyard Sound and places to the southward have a mean temperature in July and August usually above 75° (24°C).

Great interest in the study of climatology in its relation to health has been awakened in recent years by the organization

of the American climatological association, which holds annual meetings for the discussion of the subject, and has published an annual report each year since its organization in 1884.

Mineral Springs

The number of mineral springs which have been from time to time discovered within the limits of the United States amounts to from 8000 to 10,000. The waters of 300 of them have been offered for sale to the extent of more than 21,000,000 gallons, valued at about $5,000,000 (25,906,735 fr).

The waters of these springs differ very greatly in their chemical constitution, from water which contains as small an amount of solid residue as 25 or 30 parts per million, and is therapeutically but little different from distilled or rain water, to those highly charged springs, often having a high temperature, in which chlorides, sulphates, carbonates and other salts abound. The former usually owe their therapeutic action more to the quantity than to the quality of the water taken, while the latter undoubtedly exercise definite action in consequence of the mineral constituents which they contain.

A more careful study and investigation of these springs than has yet been made would undoubtedly bring to light many important facts in regard to their value which are yet unknown and unrecognized. A systematic and rational classification is much needed, as well as a uniform method of chemical analysis and interpretation. Specially is it desirable, in order to compare results with those of the best foreign authorities, to abandon the old expression of "grains per gallon," substituting therefor some of the ordinary decimal expressions of notation. The best summary of the springs of the United States, in recent years, is that which was published by Dr A. C. Peale in the annual report of the director of the United States geological survey, 1892–1893, containing the maps representing the location of the different mineral springs whose waters are used commercially, and the health resorts located near them.

The Relation of the General Government to the Public Health

Several departments of the general government have greater or less connection with sanitary questions, either directly or indirectly, and specially those departments which have medical officers as an essential part of their working forces.

The **surgeon general's office** of the war department maintains a constant oversight of the health of the military forces, including the sanitation of military camps, barracks, forts, hospitals and everything that pertains to military hygiene; the food of the soldier in time of war, and specially the selection of the daily ration in tropical climates, his clothing and equipments, require the most careful attention.

The **library** of the surgeon general's office contains the largest collection of medical works in the world, as shown in its published catalog.

The **navy department,** through its bureau of medicine and surgery, exercises a similar care over the sailors and marines of the navy, and much of the well known efficiency of this branch of the service, in the recent war, was due in a great measure to the fact that the personnel of the service, the sailors and marines, were selected healthy men, well-fed, well-clothed and well-cared for.

The department maintains a system of naval hospitals distributed at the several naval stations in different parts of the country. It has also established a museum of hygiene at Washington, in which is exhibited a great variety not only of the sanitary appliances used on naval vessels, but also a general exhibit of subjects pertaining to public health.

The **marine hospital service** is a branch of the treasury department, originally constituted for the purpose of giving relief to "sick and disabled seamen." For this purpose a large number of well equipped hospitals are maintained, at or near the principal sea-ports and lake-ports throughout the country. The service is under the charge of a supervising surgeon general, with a large force of medical officers.

The functions of this branch of the public service (organ-

ized near the close of the last century) have been enlarged from time to time, the most important of its new duties being the inspection of quarantine.

Under the Act of 1893 (February 15) giving additional powers to this branch of public service, its surgeon general was required to examine all local seaboard quarantine regulations, and to cooperate with such local authorities in the enforcement of the local and national regulations, as well as those relating to intercourse between states and territories. Provision was also made for rules and regulations for such places as had insufficient protection under local authorities.

The same act provided for obtaining and publishing weekly reports of the sanitary condition of foreign ports from which infectious diseases might be transmitted to the United States.

By an Act of 1890 (March 27) the same authority was required to prepare rules and regulations (under the direction of the secretary of the treasury) for preventing the spread of cholera, yellow fever, small-pox or plague from one state or territory to another. The secretary of the treasury is also authorized to employ inspectors to execute such regulations.

Another branch of public service which is in close touch with the subject of hygiene in certain directions is the **department of agriculture,** which maintains in its bureau of animal industry a continuous investigation of animal diseases, and specially of those which are communicable from animals to man, and hence are of vital consequence from a sanitary point of view.

The chemical work of this department has also rendered useful service to public health, in consequence of the published results of its investigations with reference to the food products of the country, and its inquiries on the subject of food adulteration.

Each of the foregoing branches of public service issues annual reports, together with many other special documents, as occasion requires.

The **census office,** a branch of the department of the interior, collects and publishes information once in 10 years relating to the vital statistics of the population, reference to which is made in another part of this monograph (page 65).

STATE MEDICINE

The term "**state medicine**" admits of a broader interpretation than preventive medicine or public health, since it includes the latter, together with such correlated subjects as medical education, the registration of medical practitioners, inquest laws, medical expert testimony, and other topics involving the relation of the physician to the state in his professional capacity.

Medical Education

A comparison of the condition of the **medical education** to-day in the United States with that which prevailed in the middle of the century shows a very great advance, and the opportunities furnished to every young man or woman now entering upon a course of study are such as were little thought of in earlier periods. Within a few years the period of attendance upon lectures at many medical colleges has increased from 2 to 3 courses and in some to 4. There is also a tendency to require that chemistry, botany, comparative anatomy, and other allied branches should be considered as preliminary work, and that the medical student should receive instruction in them at some college or scientific school previous to beginning his course of medical study. In the department of instruction in preventive medicine, or hygiene, there is opportunity for much improvement, and the day is not far distant when our medical men will receive special training for this line of work, as is now afforded in England where the degree of D.P.H. (diploma in public health) is now granted. There is a rapidly increasing demand for men to fill the places of public health officials, chemists and bacteriologists for this special line of work. The importance of the position of medical men in this connection is recognized by the fact that no sanitary board or organization in any state or large city is

ever established without including one or more physicians in its membership, and in very many instances the entire board consists of medical men.

It is therefore important, not only that **educational facilities** should be afforded for this branch of official work, but that they should be of the highest character. It is also important that such men should receive special training in the recognition of the principal infectious diseases, by means of clinical instruction. It is on account of the lack of this education that errors in the diagnosis of small-pox are of very frequent occurrence among those who are called on to fill the position of health officers of cities. A recent writer[1] states that in 2 different towns of about 10,000 inhabitants, every physician except 1 failed to recognize small-pox. In another town of 4000 inhabitants all but 1 physician failed to recognize the disease. In another town with an outbreak of 30 to 40 cases the disease was called a "continued eruptive fever", no one recognizing it, and this mistake has occasionally accounted for the rapid spread of the disease.

The development of the **laboratory** as a useful adjunct, not only of medical education, but also of state and municipal sanitary work, has contributed vastly to the successful operation of boards of health and the prevention of the spread of disease and the consequent lowering of the death-rate.

There can be no doubt that the recent general inauguration of a system of state **examinations** of applicants for license to practise medicine has had a good effect in raising the standard of medical education throughout the country, in suppressing quackery and diminishing the number of ignorant pretenders and consequently of producing better material from which competent health officers may be selected.

The old time practitioner, the country doctor, an all-round physician who was accustomed to rely on his own resources, and to accept all emergencies which came to his door, even to

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1) Article on medical education by Dr Geo. G. Groff, American academy of medicine. *Bulletin*. February 1898. p. 248.

the extraction of teeth, the occasional performance of a capital operation, or relieving the distress of a sick or injured domestic animal, is becoming less and less numerous, while every branch of specialism is full to overflowing. One great reason for this changed condition is the tendency to urban aggregation in all parts of the country. It was quite a common saying at an earlier period that 1000 people were sufficient to support a physician, as an average throughout the community, and that was about the usual proportion. Possibly, the former part of this statement is true to-day as an average, since a very considerable portion of the whole number of medical men is in the position of waiting for support.

The actual **number** of **registered physicians** in the United States, according to the most recent count, shows an average for the whole of about 1 to 647 inhabitants, but the proportion in the different states varies greatly. California appears to be the state which is most liberally supplied, the proportion there being 1 physician to 420 inhabitants, while in Iowa nearly the same conditions prevail. On the other hand, in North and South Dakota and New Mexico, the proportion was respectively 1 to 1285, 1296 and 1391 inhabitants.

The following table presents the figures for each state. For some of the states the figures will probably require revision at the next census but may be regarded as approximately correct. The relative conditions in each state are also graphically shown on chart No. 5.

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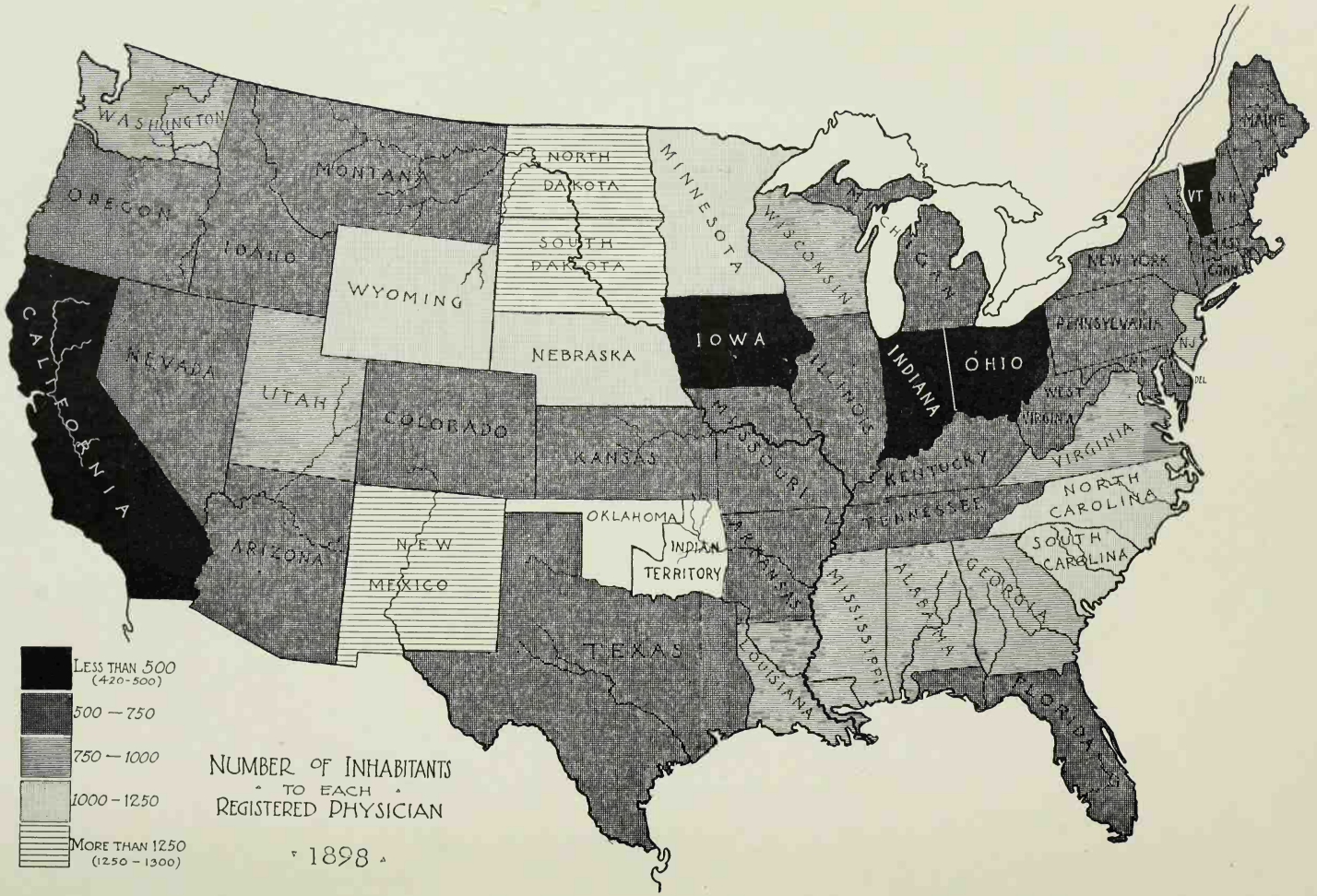
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MISSISSIPPI
ALABAMA
GEORGIA
FLORIDA
SOUTH CAROLINA
NORTH CAROLINA
VIRGINIA
WEST VIRGINIA
PENNSYLVANIA
NEW YORK
MAINE
VT
NH
MASS
CONN
RI
NJ
DEL
MD
Less than 500 (420-500)
500 — 750
750 — 1000
1000 — 1250
More than 1250 (1250 — 1300)
NUMBER OF INHABITANTS
TO EACH
REGISTERED PHYSICIAN
1898

NUMBER OF INHABITANTS TO EACH REGISTERED PHYSICIAN

Name of state	Number of inhabitants to each physician, 1898		Name of state	Number of inhabitants to each physician, 1898	
California	420	Less than 500	Virginia	810	750–1000
Iowa	422		Georgia	811	
Indiana	466		New Jersey	827	
Vermont	480		Alabama	843	
Ohio	492		Washington	887	
Illinois	517	500–750	Wisconsin	888	
Arizona	524		Louisiana	908	
Missouri	527		Mississippi	914	
Colorado	535		Utah	978	
Tennessee	538		Minnesota	1043	1000–1250
Massachusetts	539		Wyoming	1065	
New Hampshire	553		Nebraska	1085	
Maryland	559		South Carolina	1148	
New York	565		North Carolina	1173	
Texas	570		North Dakota	1285	More than 1250
Arkansas	580		South Dakota	1296	
Maine	594		New Mexico	1391	
Kentucky	607				
Nevada	614				
Michigan	625				
Connecticut	659				
Rhode Island	659				
Oregon	669				
West Virginia	670				
Pennsylvania	670				
Oklahoma[1]	692				
Florida	696				
Delaware	705				
Montana	717				
Idaho	727				
Kansas	737				

Registration of Medical Practitioners

The first general movement in the direction of establishing general or state boards of health began about the middle of the century, and resulted in the establishment of the Louisiana, Massachusetts and California boards before the close of 1870.[2] No recent or successful movement, however, was organized in the direction of limiting and restricting medical practitioners, till a law was enacted in Illinois, in 1877, for the regulation of medical practice and conferring authority for its

1) In the chart facing this page, the space assigned to Oklahoma is blank, in consequence of uncertainty as to the population at the time of preparing the chart, but information received later affords an opportunity to state the population for 1898 with reasonable accuracy, and hence, to present the figures given above (see appendix 1, p. 87).

2) See notes on these boards in appendix 3.

enforcement on the state board of health.[1] Up to that time the most ignorant and untrained charlatans could practise in any part of the United States without fear of the law, but by the persistent and untiring energy of Dr John H. Rauch, secretary of the Illinois board of health, the law was carried into effect, and as a result "out of 3600 non-graduates who were practising medicine in the state when the act went into effect, about 1400 left the state, or ceased to practise."[2] These irregular practitioners settled in other states for the transaction of their business, wherever a credulous public was willing to tolerate their presence.

This action on the part of Illinois resulted almost immediately in the attempt of many other states to take similar measures for their own protection, and in several instances, mostly in the new states, similar laws were enacted with but little opposition, while in some of the older states it was only after several years of persistent and long-continued effort, chiefly on the part of the medical profession, that legislation was finally secured. The chief points in these laws consist:

1) In the registration of all practising physicians.

2) In the examination of candidates for license to practise.

The first of these, registration, is a feature of all the laws, while examination of candidates is not required in all the states. In some of them the presentation of a diploma from some reputable medical college is the essential feature, and the examination of candidates is not required. Dr McIntire classifies the states in 4 groups, according to their several requirements, and his classification has been followed in preparing the following list, and also chart No. 6, in which the facts shown in the list are graphically presented.[3]

The following summary presents the results of examinations

1) Laws had existed in some states for nearly a century restricting medical practice, but they had either become inoperative, or had been repealed. For a full discussion of this subject, see annual address by Dr R. H. Fitz in *Transactions of Massachusetts medical society*. v. 16, 1894. p. 275.

2) Buck's *hygiene*. v 1. p. 58.

3) American academy of medicine. *Bulletin*. February 1897. p. 700. For details of this classification, see appendix 1.

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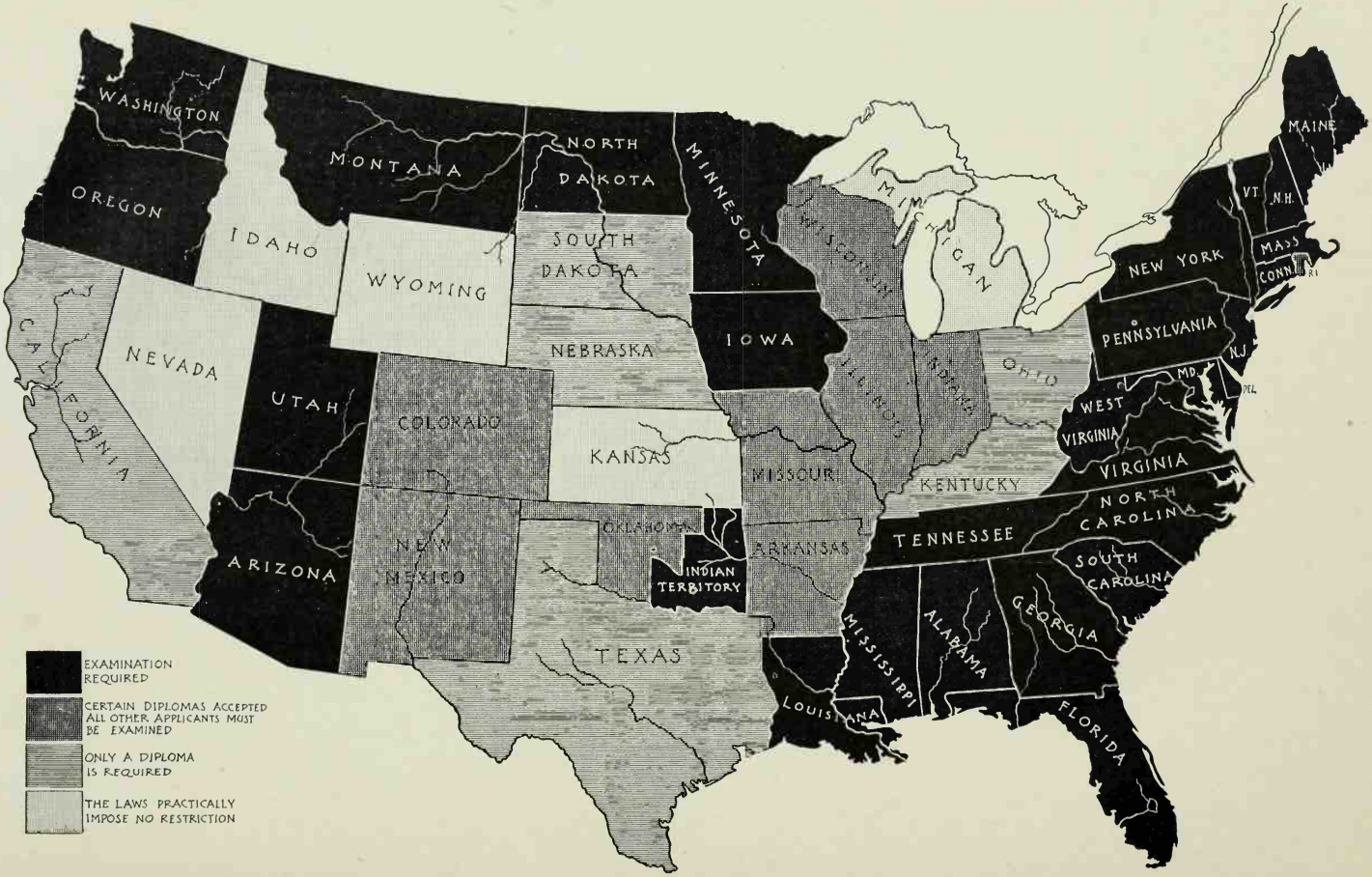

REGISTRATION OF PHYSICIANS

made in 1898 in those states from which accurate returns could be obtained.[1]

Total number examined 2890; number accepted 2328; rejected 562.

Registration of Physicians

Class A	Class B
Alabama	Arkansas
Arizona	Colorado
Connecticut	Illinois
Delaware	Indiana
District of Columbia	Missouri
Florida	New Mexico
Georgia	Oklahoma
Indian Territory	Rhode Island
Iowa	Wisconsin
Louisiana	
Maine	Class C
Maryland	California
Massachusetts	Kentucky
Minnesota	Nebraska
Mississippi	Ohio
Montana	South Dakota
New Hampshire	Texas
New Jersey	
New York	Class D
North Carolina	Idaho
North Dakota	Kansas
Oregon	Michigan
Pennsylvania	Nevada
South Carolina	Wyoming
Tennessee	
Utah	
Vermont	
Virginia	
Washington	
West Virginia	

1) American academy of medicine. *Bulletin*. February 1899. p. 691.

There is very little uniformity in the details of the laws, but they can all be classed under 4 general divisions, as follows :[1]

A) Examination required.
B) Certain diplomas are accepted ; all other applicants must be examined.
C) Only a diploma is required.
D) The laws practically impose no restriction.

Inquest Systems of the United States

The method of procedure employed in most of the United States for the investigation of the cause of death in cases occurring from violent, sudden, or suspicious causes is the coroner system, a method which had its origin in England at least 7 or 8 centuries ago, but is unknown either in Scotland or on the continent of Europe. For the efficient operation of this system several officials are usually employed, a coroner, a coroner's physician, a jury of 6 men or more, and an officer who is employed to summon the jury. The coroner usually makes a view or a superficial examination of the body, and if in his opinion the cause of death was of a violent or criminal character, he causes a jury to be summoned, and if a more thorough investigation is required, in order to reveal the cause of death, he directs a medical man to make an autopsy.

Following the example of some of the principal continental countries some of the states have introduced a new and more direct method for the investigation of this class of deaths, namely, the medical examiner system, the principal features of which are the following: the abolition of the jury and the substitution in place of the coroner (an official supposed to combine the incongruous functions of law and medicine) of a medical examiner to determine the cause of death, and the reference of all legal questions to a district judge. In those states where this plan has been adopted its operation has been

1) American academy of medicine. *Bulletin.* February 1897; February 1898; February 1899. Articles entitled "State requirements for the practice of medicine," by Charles McIntire, A.M., M.D., Easton, Pa.

perfectly satisfactory, and there is no desire to return to the musty traditions of the past.

The **abolition of the jury** was shown to be both rational and economical, since every case in which criminal violence is shown must necessarily be revised in the courts before another jury, whenever the actual culprit can be found, and this waste of the public funds, in paying 6 or more men who are usually absolutely unqualified to consider expert medical questions, constitutes a public farce. Cases of the grossest neglect, incompetence and fraud had become of such common occurrence under the old method that a change was deemed imperative. In a city of about 300,000 inhabitants there were 47 coroners in commission, where 2 medical men with 1 associate now conduct the same work in a population 60% greater, and in a far more satisfactory manner.[1]

The medical system here referred to has been adopted either as a whole, or in part, in the states of Massachusetts, Rhode Island and Connecticut.

1) *Philadelphia medical journal*, January 15, 1898. Article by the writer.

Appendix I

STATISTICAL TABLE

1	2	3	4	5	6	7	8	9	10	11
Name of state or territory	Population, 1890	Estimated population, 1898	Has a state board of health	Per capita expenditure by state boards of health, 1898		Per cent of population in towns supplied with public water, 1860	Per cent of population supplied with public water, 1896-97	Per cent of population in sewered towns, 1896-97	Number of inhabitants to each physician, 1898	Registration of physicians classified, 1899
				Fractions of a dollar	Fractions of a franc					
Alabama [2]	1 513 017	1 713 427	Yes [1]	.0020	.010	0.4	11.5	7.5	843	A
Arizona	59 620	74 964	No	.0000	.000	0.0	26.6	5.3	524	A
Arkansas	1 128 179	1 388 702	Yes	.0036	.019	0.0	7.7	2.2	580	B
California	1 208 130	1 482 879	Yes	.0027	.014	20.1	57.7	39.1	420	C
Colorado	412 198	586 494	Yes	.0042	.022	0.0	57.0	43.2	535	B
Connecticut [2]	746 258	845 104	Yes	.0092	.048	22.7	73.5	52.7	659	A
Delaware	168 493	186 001	Yes	.0070	.037	18.9	46.4	38.3	705	A
Dist. of Columbia [7]	230 392	272 606	–	–	–	–	–	–	–	A
Florida	391 422	488 965	Yes	.0866	.450	0.0	22.3	13.4	696	A
Georgia	1 837 353	2 073 491	No	.0000	.000	3.3	15.6	10.2	811	A
Idaho	84 385	125 805	No	.0000	.000	0.0	22.2	6.1	727	D
Illinois [2]	3 826 351	4 425 135	Yes	.0021	.011	6.4	50.3	38.0	517	B
Indiana	2 192 404	2 363 686	Yes	.0021	.011	0.7	30.5	17.9	466	B
Indian Territory	–	–	–	–	–	–	–	–	–	A [4]
Iowa	1 911 896	2 141 721	Yes	.0023	.012	0.0	24.1	11.8	422	A
Kansas	1 427 096	1 771 896	Yes	.0015	.008	0.0	24.3	11.4	737	D
Kentucky [2]	1 858 635	2 026 591	Yes	.0012	.006	6.2	21.5	12.5	607	C
Louisiana [2]	1 118 587	1 261 500	Yes	.0040	.021	23.8	26.3	1.0	908	A
Maine	661 086	670 806	Yes	.0112	.059	1.2	52.1	26.3	594	A
Maryland	1 042 390	1 128 348	Yes	.0049	.026	31.3	50.1	42.6	559	A
Massachusetts	2 238 943	2 603 629	Yes	.0224	.116	24.3	90.1	63.3	539	A
Michigan	2 093 889	2 459 451	Yes	.0035	.018	6.1	41.8	30.1	625	D
Minnesota	1 301 826	1 718 668	Yes	.0105	.055	0.0	41.0	28.0	1043	A
Mississippi [2]	1 289 600	1 416 002	Yes	.0141	.074	0.0	6.3	1.0	914	A
Missouri [2]	2 679 184	3 087 827	Yes	.0016	.008	13.6	32.6	24.9	527	B [5]
Montana	132 159	206 559	No	.0000	.000	0.0	40.2	23.1	717	A
Nebraska [2]	1 058 910	1 544 116	Yes	.0001	.0005	0.0	35.9	22.6	1085	A
Nevada	45 761	32 557	Yes	.0015	.008	0.0	52.6	27.6	614	C
New Hampshire	376 530	400 161	Yes	.0106	.055	6.7	66.1	39.1	553	D
New Jersey	1 444 933	1 695 987	Yes	.0089	.046	26.8	82.0	63.7	827	A
New Mexico [2]	153 593	180 815	Yes	.0000	.000	0.0	17.4	3.6	1391	A
New York	5 997 853	6 729 839	Yes	.0052	.027	34.7	72.3	58.8	565	B
North Carolina	1 617 947	1 792 505	Yes	.0011	.006	0.0	7.6	1.6	1173	A
North Dakota	182 719	299 367	Yes	.0040	.021	0.0	12.5	4.5	1285	A
Ohio	3 672 316	4 051 719	Yes	.0040	.021	9.6	42.9	32.6	492	C
Oklahoma [2]	56 496	311 400 [6]	Yes	.0032	.017	0.0	26.6	7.4	692	B
Oregon	313 767	424 966	No	.0000	.000	0.0	40.2	26.0	669	A
Pennsylvania	5 258 014	6 038 112	Yes	.0010	.005	27.0	66.0	40.9	670	A
Rhode Island [2]	345 506	400 686	Yes	.0142	.074	29.0	89.7	56.0	659	B
South Carolina	1 151 149	1 275 607	Yes	.0012	.006	0.0	10.6	5.5	1148	A
South Dakota [2]	328 808	513 240	Yes	.00097	.005	0.0	16.4	3.1	1296	C
Tennessee	1 767 518	1 947 645	Yes	.0029	.015	1.7	15.2	8.1	538	A
Texas [3]	2 235 523	2 750 542	Yes [3]	.0016	.008	0.0	19.8	8.4	570	C
Utah	207 905	259 059	Yes	.0098	.051	0.0	39.8	30.1	978	A
Vermont	332 422	332 530	Yes	.0301	.160	1.4	39.3	17.1	480	A
Virginia	1 655 980	1 770 712	Yes	.0011	.006	4.4	18.9	10.9	810	A
Washington	349 390	568 809	Yes	.00066	.003	0.0	50.6	32.1	887	A
West Virginia [2]	762 794	878 264	Yes	.0017	.009	4.7	13.5	6.2	670	A
Wisconsin	1 686 880	1 983 986	Yes	.0028	.015	0.0	36.7	25.8	888	B
Wyoming	60 705	92 638	No	.0000	.000	0.0	55.5	19.3	1065	D

1) The state board of health of Alabama is the state medical association.

2) In these states the state board of health is also the board of registration of medical practitioners.

3) Texas has a health officer who performs the duties of a state board of health.

4) Cherokee and Choctaw nations only.

5) A decision of supreme court has made the regulations inoperative.

6) These are the figures of the territorial census of 1898.

7) The District of Columbia is practically a municipality under control of the national government.

Notes on the Foregoing Table

The table, appendix I, presents in detail the figures quoted under the topics relating to state boards of health, public water-supplies, sewerage, and registration of medical practitioners. Six charts also illustrate the same subjects.

Column 3 Estimated population 1898. The figures in this column were obtained by the usual method adopted by most sanitary authorities, the annual increase between the 2 previous census enumerations. No inflexible rule can be applied to the populations of the different states with accurate results, in consequence of the extremely variable conditions of migration which influence the different parts of the country. It was therefore deemed best to adopt one method for all (except Oklahoma, where a state census was made in 1898), nearly a decade having elapsed since the last census, at the time of preparing this monograph. The results will probably be fairly correct for the older states and those having large populations, but considerable allowance may possibly be necessary for the newer and rapidly increasing states and territories, such as Nebraska, Idaho, Washington, Montana, Oklahoma[1] and the 2 Dakotas.

The population of only one state, Nevada, had diminished between the 2 census enumerations of 1880 and 1890, while that of Vermont was practically stationary.

Alaska, the Indian territory, and the more recently acquired possessions are not treated in this table.

The population of Alaska in 1890 was 32,052. The census of the Indian territory and reservations in other districts not included in the general enumeration of 1890 was 325,464.

The District of Columbia is not embraced in the principal columns, since it should be treated as a municipality. The population of the district outside the city of Washington constitutes but a small fraction of the district.

The figures in columns 5 and 6 were computed on the basis of the estimated population of 1898, since the financial statements of the different boards of health were chiefly of that year.

The figures in column 7 were computed from the census enumerations of 1860.

1) The census of 1890 gave this territory a population of 56,496, but a territorial census taken in 1898 found a population of 311,400, which seems reasonable, since the report of the territorial governor of the previous year (1897) states that there were 90,585 children of school age in the territory in that year.

Those of columns 8 and 9 were computed from the census of 1890, since the actual ratio of the estimated population of the towns supplied with water and sewers in 1896–97 to the estimated total population in the same years, would not differ very greatly from the ratio of the same towns in 1890 to the total population of 1890.

The figures in column 10 were computed on the estimates given in column 3 and may, therefore, be subject to slight changes at the next census.

The authority for the information presented in this table is as follows:

Column 2 Populations. The United States census.

Column 4 Transactions of the American public health association and correspondence. v. 24. Columbus, Ohio, 1898.

Columns 5 and 6 Annual reports of state boards of health, the state laws of each state for 1897 and 1898, and from correspondence with the secretaries of state boards of health. The state laws present appropriations only, but the appropriations and the expenditures do not usually differ much, and the appropriation shows quite as well as the expenditures, the support given by the people to the general sanitary authority. In a few instances, in the case of unexpected epidemics, the appropriation has been largely exceeded, and in some states this emergency is provided for by a contingent fund.

Columns 7, 8 and 9 Manual of American water works, editions of 1883 to 1897.

Column 10 Polk's *register of physicians*. Detroit, 1898.

Column 11 Articles by Dr McIntire in *Bulletin* of American academy of medicine, February 1897, February 1898 and February 1899.

Notes on columns 5 and 6 (expenditures): In most instances the figures were computed from the annual appropriations, in the following instances from the expenditures:

Connecticut: $5310 for general expenses in 1898, and $2404.35 for water investigation.

Florida: The state board of health has a revenue from quarantine fees. The receipts from this revenue in 1898 were $35,940.85.

Maryland: Out of the total appropriation, $2500 is for food and drug inspection, $1800 for vital statistics, and $2500 for infectious disease investigation.

Louisiana: The board receives no regular appropriation. The

appropriation for 1898, on which the per capita expenditure was estimated, was a special appropriation "for first aid" to the parishes. The board derives a revenue from quarantine fees and inspection of illuminating oil.

Massachusetts: The expenditures for 1898 were as follows: general expenses, $17,231.98; food and drug inspection, $11,062.68; protection of purity of inland waters, $29,999.66.

Michigan: General expenses, $6000; $2500 to enable the board to supply teachers with information to teach in the schools the best methods of restricting and preventing dangerous communicable diseases.

Pennsylvania: The board expended $383,852.62 in 1889 at the time of the great flood at Johnstown, including inspection and disinfection. In this flood, which was caused by the bursting of a dam near the head waters of the Conemaugh river, 2300 lives were lost. The board also expended $7800 in 1899 for the suppression of small-pox.

Rhode Island: General expenditures, $3395.48; vital statistics, $1000; infectious diseases, $2292.52.

Texas: The expenditure is made for frontier and sea-coast purposes, mainly for quarantine.

Vermont: General expenses, $2000, and $8000 for maintenance of state laboratory.

The figures presented in columns 5 and 6 have reference only to the amounts expended by, or appropriated for the use of state boards of health. These sums are only a small fraction of the amounts actually expended in the states for sanitary purposes. The exact sum expended by state boards of health in 1898 can not be stated, since in several instances appropriations only were returned, but making allowance for a slight difference between expenses and appropriations, the total sum expended by such boards in 1898 can not have been far from $360,000. The total amount expended in the country for all sanitary purposes, comprises a considerable number of items, and was very much greater than the sum named as expended by state boards of health alone. The municipal boards in each state, as a general rule, expend much more than the state boards, since the funds of those boards are chiefly devoted to executive work.

For example, the state board of health of Rhode Island expended in 1898 $6,688, while the health commissioner of Providence, the

chief city of the state, reports an expenditure of $110,484 for sanitary purposes, including street cleaning and garbage collection. In some other states the ratio between these 2 items differs still more greatly.

To the expenditures of state and municipal boards there should be added large sums paid for the work of inspection and slaughter of infected domestic animals, as well as that which is appropriated for the work of experiment stations and special food and dairy commissioners not connected with state boards of health.

The general government also expends annually a considerable sum in its 3 branches of the military, naval and marine hospital service, in maintaining the health of the army, navy and the merchant marine, and for quarantine inspection. In the department of agriculture, the bureau of animal industry and other branches of service are maintained very largely for direct sanitary work affecting the health of the people at large.

In the case of most of the older eastern states, the figures presented represent an expenditure made for general sanitary purposes, whether of an advisory or of an executive character. But in the case of several of the southern states, and specially of those bordering on the gulf of Mexico, large powers have been given to the state boards almost exclusively for quarantine purposes, in preventing the introduction of certain infectious diseases, chiefly yellow fever, from the neighboring West India Islands and from Central and South America.

In a few states the state board of health derives a revenue from the examination of applicants for medical registration.

Note on column 9, Louisiana: New Orleans had no completed system of sewers at the date of compiling this table, but a committee has recently been appointed to consider the subject and report on it.

Puerto Rico: A general or superior board of health was established for the island of Puerto Rico in 1899, whose duty it is to have "general supervision of the interests of the public health of the island, and to specially study its vital statistics."

The board is further required to "make sanitary investigations and inquiries respecting the causes of disease" and "to disseminate information upon these and similar subjects among the people."

It is also required to make "sanitary inspections of public institutions" and to consider and report on "plans for all new water-supplies, sewerage plants," etc.

Its different duties and functions cover 23 different topics, all having reference to the public health.

A letter from the secretary of the superior board of health, dated October 23, 1899, states that "at this moment the existence of a case of small-pox is unknown on this island. Nine months ago a serious epidemic was threatened, and the disease prevailed over the whole island. Since then 800,000 vaccinations have been performed. It is possible to stamp out small-pox in Spanish-American countries. There have been no yellow fever cases all summer. No serious diseases have followed the hurricane."

The board also issued several circulars relating to the prevention of the spread of infectious diseases. The population of the island is about one million. Eight or ten towns have public water-supplies. Three larger towns have sewerage systems.

Appendix II

MUNICIPAL STATISTICS

	Population, census of 1890	General death-rate	Deaths from certain causes Percentage of total mortality						Cost of maintenance of health dept.	Square yards of streets swept per week	Garbage burned or otherwise disposed of
			Consumption	Typhoid fever	Diphtheria and Croup	Scarlet fever	Cholera Infantum	Cancer			
Albany	94 923	18.76	12.7	5.0	3.7	.3	3.8	5.1	$9 146	1 108 114	–
Allegheny	105 287	14.16	9.3	4.0	1.8	.6	5.2	3.0	20 926	600 000	11 852
Baltimore	434 439	18.82	10.5	1.9	4.0	.4	3.8	3.2	81 252	17 516 771	144 820
Boston	448 477	18.54	12.4	1.8	1.8	.3	4.4	1.1	149 890	8 660 440	909 680
Buffalo	255 664	12.25	9.3	2.2	1.6	.3	5.6	4.7	43 659	–[2]	–[2]
Chicago	1 099 850	13.92	10.7	2.8	3.0	.3	2.5	3.5	174 404	8 848 500	1 010 682
Cincinnati	296 908	12.86	12.3	2.0	1.4	1	1.4	3.7	41 245	3 028 550	36 910
Cleveland	261 353	12.37	9.6	2.6	3.6	.6	3.5	3.7	41 851	–[2]	–[2]
Columbus	88 150	9.92	15.8	2.4	1.1	.1	2.4	5.6	10 866	–[2]	–[2]
Denver	106 713	11.54	26.0	2.1	1.8	.5	2.0	3.2	40 298	3 872 000	12 000
Detroit	205 876	13.89	8.9	1.1	3.3	.9	5.6	3.6	43 048	–[1]	–[2]
Indianapolis	105 436	10.83	13.0	2.2	2.0	.5	3.5	5.1	8 864	–[2]	–[2]
Jersey City	163 003	18.36	12.2	2.0	3.5	1.7	2.8	2.5	9 015	–[2]	–[2]
Kansas City	132 716	10.73	4.9	1.9	1.6	.3	1.6	4.1	34 999	11 200 000	25 000
Louisville	161 129	13.59	10.4	3.9	1.2	.1	1.5	3.9	7 493	1 770 423	–[1]
Milwaukee	204 468	10.34	10.9	1.6	1.5	.1	11.8	5.7	30 892	4 882 532	–[4]
Minneapolis	164 738	8.62	13.2	4.4	1.5	.1	1.8	5.4	38 109	3 203 000	–[3]
Newark	181 830	17.78	14.6	1.0	3.2	.4	7.2	3.1	50 117	1 987 392	–[2]
New Orleans	242 039	24.39	12.9	2.7	.2	.0[1]	2.3	2.6	38 804	1 333 200	191 250
New York[6]	1 515 301	18.68	12.0	1.0	2.8	1.1	3.3	3.1	535 569[6]	–[5]	4 527 204
Omaha	140 452	6.29	11.8	3.6	1.8	.1	5.0	5.0	7 606	480 000	–[3]
Philadelphia	1 046 964	17.56	11.9	2.9	5.4	.5	5.0	3.1	247 164	–[2]	252 448
Pittsburg	238 617	16.66	6.8	4.4	1.8	.5	1.6	2.3	75 879	10 666 665	35 555
Providence	132 146	17.60	11.4	1.4	1.4	.1	5.0	4.2	19 068	–[1]	–[2]
Rochester	133 896	12.52	12.2	1.0	1.9	.4	2.6	5.0	8 742	1 139 893	–[2]
St Louis	451 770	14.13	11.4	1.1	2.3	.3	4.7	3.4	98 515	–[2]	520 000
St Paul	133 156	8.51	11.3	2.3	4.5	.8	1.8	3.0	9 578	3 385 300	–[2]
San Francisco	298 997	18.18	15.9	.9	2.4	.1	.7	5.7	114 073	–[2]	–[1]
Syracuse	88 143	12.18	16.0	3.0	2.6	.8	6.6	2.3	23 424	1 933 881	21 972
Toledo	81 434	9.10	9.9	2.2	1.9	.4	4.1	3.3	12 722	760 000	–[2]
Washington	230 392	20.58	12.0	2.9	3.2	.3	2.3	3.0	44 054	–[2]	–[2]
Worcester	84 655	16.61	12.3	.7	1.9	.3	7.3	3.3	17 119	334 099	–[3]
									$2 088 390[7]	86 710 761[8]	7 699 373[9]

1) Not stated.
2) By contract.
3) Disposed of by householders.
4) 38,000 tons (34,580 tonneaux).
5) Partly by contract.
6) For the year 1896, quoted from report of that year, p. 59. (This does not include Brooklyn and other boroughs added in 1897 and making in all a population of about three and one-half millions.)
7) 10,828,674 francs.
8) 72,500,636 square meters.
9) 5,886,370 cubic meters.

Notes on the Foregoing Table

This table is compiled from the bulletin of the United States department of labor (September 1899, No. 24), entitled "statistics of cities," and presents certain sanitary statistics of the 32 largest cities of the United States for the year 1898.

The items presented are the following:

Population, 1890. Death-rate, 1898 (upon an estimated population compiled by the department). Percentage which each of the following diseases bore to the total mortality: Consumption. Typhoid fever. Diphtheria and croup. Scarlet fever. Cholera infantum. Cancer. Cost of maintenance of health departments. Square yards of streets swept per week. Cubic yards of garbage burned or otherwise disposed of.

The figures in the column of expenses of health departments do not represent all expenses for sanitary purposes, since in some cities such departments as street cleaning and garbage disposal are administered by other boards. For example, in Providence, R. I., the total amount expended for sanitary purposes is reported by the health commissioners, in 1898, as $110,484.44 (572,354 fr.) of which more than three-fourths is expended by departments other than the board of health.

In Pittsburgh, $143,619.63 (744,143 fr.) was expended in 1898 for street cleaning, and $77,717.84 (402,683 fr.) for garbage collection and disposal by other boards.

In Buffalo, $63,993.50 (331,572 fr.) was appropriated for the year 1899, which sum includes $15,000 for a free bath-house, and $5,000 for "quarantine hospital." In addition to the expenses of the health department, $310,840 (1,610,570 fr.) are appropriated for street cleaning, garbage and ash collection and disposal.

In Minneapolis, $41,699 (216,057 fr.) was expended in 1898 for street cleaning, by a separate department.

In New Orleans, the annual cost of street cleaning is about $58,000; garbage and ash collection, $97,000, and quarantine, $60,000; total, $215,000 (1,114,000 fr.).

In Cleveland, the amount appropriated in 1899 for sanitary purposes, garbage and ash collection, and other minor matters, was $176,000 (916,062 fr.).

In Chicago, the amount appropriated in 1899 for street cleaning was $385,424 (2,000,000 fr.) and for disposal of garbage and ashes, $450,000 (2,331,600 fr.).

Appendix III

NOTES ON THE HEALTH LAWS OF CERTAIN STATES

The following laws are quoted chiefly for the purpose of showing the methods under which some of the first state boards of health were established, since these laws show radical differences in their organization.

The state board of health of Louisiana, while nominally a state board of health, is practically a municipal board acting for the city of New Orleans. It was appointed chiefly to take charge of quarantine for the protection of the city, and consequently of the river population living above the city. This was its main object as stated in the Act of 1855, in which the qualifications of its members were stated as follows: "The said members shall be selected with reference to their known zeal in favor of a quarantine system." Of the 28 sections in the organic Act of 1855, nearly all related to the one important subject of quarantine.

As a municipal organization this board was created March 17, 1818, under an act having the following title, "An Act to establish a board of health and health officer, and to prevent the introduction of malignant, pestilential and infectious diseases into the city of New Orleans."

By an act of March 15, 1855, entitled "An Act to establish a quarantine for the protection of the state" the board of health and their successors were "created a body corporate, under the name of the board of health of the state of Louisiana, to sue and be sued under that title" (section 27, Act of 1855), and the sum of $50,000 was appropriated for its use.

The board was again reorganized March 1870, and again April 20, 1877, under the latter statute, it was authorized to act in conjunction with the city council, in the capacity of a board of health for the city of New Orleans.

The following act is the organic law creating the state board of health of Massachusetts. It served as a model in the creation of many other boards, and is therefore quoted in full, together with that of California, the state which immediately followed Massachusetts in creating a state board of health.

AN ACT TO ESTABLISH A STATE BOARD OF HEALTH

§ 1 The governor, with the advice and consent of the council, shall appoint seven persons who shall constitute the board of health and vital statistics. The persons so appointed shall hold their offices for seven years: provided, that the terms of office of the seven first appointed shall be so arranged that the term of one shall expire each year, and the vacancies so created, as well as all vacancies occurring otherwise, shall be filled by the governor with the advice and consent of the council; but any one may be reappointed.

§ 2 The board shall take cognizance of the interests of health and life among the citizens of this Commonwealth. They shall make sanitary investigations and inquiries in respect to the people, the causes of disease, and especially of epidemics, and the sources of mortality and the effects of localities, employments, conditions and circumstances on the public health; and they shall gather such information in respect to those matters as they may deem proper, for diffusion among the people. They shall advise the government in regard to the location of any public institutions. They shall in the month of January, make report to the legislature of their doings, investigations and discoveries during the year ending December 31st, with such suggestions as to the legislative action as they may deem necessary.

§ 3 The board shall meet at the State House once in three months, or as much oftener as they may deem expedient. No member, except the secretary, shall receive any compensation, but the actual personal expenses of any member while engaged in the duties of the board shall be allowed and paid.

§ 4 It shall be the duty of the board, and they are hereby instructed, to examine into, and report what, in their best judgment is the effect of the use of intoxicating liquor as a beverage, upon the industry, prosperity, happiness, health and lives of the citizens of the state. Also, what additional legislation, if any, is necessary in the premises.

§ 5 The board shall elect a secretary, either from their own number, or otherwise; but when elected he shall be a member of the board, and their executive officer. He shall perform and superintend the work prescribed in this law, and such other duties as the board may require. He shall receive from the treasury, in quarterly payments, an annual salary of twenty-five hundred dollars and his necessary travelling expenses incurred in the performance of official duties, after they have been audited by the board and approved by the governor and council, and all other necessary expenses arising in his office shall be paid out of the treasury in the same manner as those of the different departments of the government.

Enacted June 21, 1869.

The act establishing a state board of health in California is as follows:

§ 1 The Governor shall appoint seven physicians, two from the city of Sacramento, and the other five from different sections of the state, who shall constitute the state board of health and vital statistics. The physicians so appointed shall hold their offices for four years and until their successors are appointed, and all vacancies in the board shall be filled by the Governor.

§ 2 The state board of health shall place themselves in communication with the local boards of health, the hospitals, asylums and public institutions throughout the state, and shall take cognizance of the interests of health and life among the citizens generally. They shall make sanitary investigations and inquiries respecting the causes of disease, especially of epidemics, the source of mortality and the effects of localities, employments, conditions and circumstances on the public health; and they shall gather such information in respect to these matters as they may deem proper for diffusion among the people. They shall devise some scheme whereby medical and vital statistics of sanitary value may be obtained, and act as an advisory board to the state in all hygienic and medical matters, especially such as relate to the location, construction, sewerage and administrations of prisons, hospitals, asylums and other public institutions. They shall, at each biennial session of the legislature, make a report of their doings, investigations and discoveries, with such suggestions as to legislative action as they may deem proper.

§ 3 It shall be the duty of the board, and they are hereby instructed, to examine into and report what, in their best judgment, is the effect of the use of intoxicating liquor, as a beverage, upon the industry, prosperity, happiness, health and lives of the citizens of the state; also, what legislation, if any, is necessary in the premises.

§ 4 The board shall meet at the capital of the state, at least once in every three months, and as much oftener as they may deem proper. Their first meeting shall be held at the

capital, at the expiration of one week after their appointment shall have been made, and three members shall always constitute a quorum for business. They shall elect from their own number a president and permanent secretary; the latter shall reside at the capital, and shall be their executive officer. No member, except the secretary, shall receive any compensation; but the actual traveling expenses of the members, while engaged in the duties of the board, shall be allowed and paid out of the general fund.

§ 5 The secretary shall perform and superintend the work prescribed in this act, and shall perform such other duties as the board may require. He shall also furnish to the legislature, when in session, such information cognate to this act as from time to time they may deem necessary. An annual salary of twenty-five hundred dollars, and his office and other necessary expenses incurred in the performance of his duties, shall be paid to him in the same manner as that of other state officers.

§ 6 The expenses of the board, including the salary of the secretary, shall not exceed four thousand dollars a year.

Enacted April 15, 1870

Some recent health acts of the state of Mississippi furnish an illustration of the sanitary necessities which are forced on the Gulf states in consequence of their close proximity to tropical countries, and on account of the prevalence in these states of a semi-tropical climate throughout the summer season.

At a short extra session of the Mississippi legislature, in May 1897, an act was passed creating a department of public health with enlarged powers, providing for its organization with powers and duties quite similar to those of other boards, but making the hospital medical college at Vicksburg the bureau of vital statistics, with power to appoint county boards and physicians, to collect such statistics, to obtain vaccine lymph, and make reports to the department (laws of Mississippi, 1897, ch. 15).

By a later act of 1898, ch. 79, the state board of health is empowered to examine applicants for medical practice. It is also authorized to take charge of districts infected with yellow fever and other dangerous diseases, *and to apply proper restrictions, even to the extent of being provided by the governor with military force, to ensure a thorough quarantine.* (February 10, 1898.)

The appropriations for the board were $20,000 for each of the years 1892 and 1893; $25,000 for each of the years 1894 and 1895, and $50,000 for 1898, and $20,000 for 1899. In 1897 the expenses exceeded the appropriation by $28,591.55, which sum was promptly provided by the next legislature.

An act of the state of Indiana passed in 1899 and taking effect April 28, contains some features worthy of mention, which are as follows:

By the terms of this act the state board of health is given certain authority over local boards of health, since the latter are required by section 8 of this act "to take prompt action to

arrest the spread of contagious and infectious diseases, to abate and remove nuisances dangerous to the public health, as directed or approved by the state board of health, and perform such other duties as may be required of them by the state board of health pertaining to the health of the people. They shall elect a secretary, who shall be the health officer of the appointing board, and who shall be a graduate of a reputable medical college recognized by the state board of medical registration, who, if not already informed in hygiene and sanitary science, shall immediately so inform himself, according to the requirements of the state board of health." His salary is determined by the number of the population. The state board of health is given power "to remove at any time, any county, city or town health officer for intemperance, failure to collect vital statistics, obey rules and by-laws, keep records, make reports or answer letters of inquiry of the state board, concerning the health of the people." Provision is also made for giving the state board of health entire supervision of the vital statistics of the state.

In Illinois, the pioneer state in relation to the registration of medical practitioners, a state board of health was created by a statute of May 25, 1877. By the terms of this act a board of 7 persons was appointed to hold office for 7 years, the term of office of one member to expire each year.

Four days afterward, May 29, 1877, additional powers were conferred upon this board as follows:

"Every person practising medicine, in any of its departments, shall possess the qualifications required by this act. If a graduate in medicine, he shall present his diploma to the state board of health . . . for verification as to its genuineness. If it is found genuine, and if the person named therein be the person claiming and presenting the same, the state board of health . . . shall issue the certificate to that effect, signed by all the members thereof, and such diploma and certificate shall be conclusive as to the right of the lawful holder of the same to practise medicine in this state. If not a graduate, the person practising medicine in this state shall present himself before said board, and submit himself to such examination as the said board shall require; and if the examination be satisfactory to the examiners, the said board shall issue its certificate in accordance with the facts, and the lawful holder of such certificate shall be entitled to all the rights and privileges herein mentioned."

By other sections of this act provision was also made for fees and penalties, for the recording of certificates by county clerks, for the refusal or revocation of certificates, and for the licensing of itinerant venders of medicine.

In section 11, the term "practising medicine" is thus defined: "Any person shall be regarded as practising medicine within the meaning of this act, who shall profess publicly to be a physician, and to prescribe for the sick, or who shall append to his name the letters, "M.D.". But nothing in this act shall be construed to prohibit gratuitous services in cases of emergency. And this act shall not apply to commissioned surgeons in the United States army and navy."

Similar legislation was soon introduced and enacted in other states, until nearly every state has now provided some form of restriction. In many, this function was given to the state board of health, and in a few of the newly constituted states this is the only duty of the state board of health.

The following important act of Massachusetts is referred to on page 42.

AN ACT TO PROTECT THE PURITY OF INLAND WATERS, AND TO REQUIRE CONSULTATION WITH THE STATE BOARD OF HEALTH REGARDING THE ESTABLISHMENT OF SYSTEMS OF WATER-SUPPLY, DRAINAGE AND SEWERAGE.

[Enacted June 9, 1886; amended May 18, 1888.]

§ 1 The state board of health shall have the general oversight and care of all inland waters, and shall be furnished with maps, plans and documents suitable for this purpose, and records of all its doings in relation thereto shall be kept. It may employ such engineers and clerks and other assistants as it may deem necessary: provided, that no contracts or other acts which involve the payment of money from the treasury of the Commonwealth shall be made or done without an appropriation expressly made therefor by the general court. It shall annually on or before the tenth day of January report to the general court its doings in the preceding year, and at the same time submit estimates of the sums required to meet the expenses of said board in relation to the care and oversight of inland waters for the ensuing year, and it shall also recommend legislation and suitable plans for such systems of main sewers as it may deem necessary for the preservation of the public health, and for the purification and prevention of the pollution of the ponds, streams and inland waters of the Commonwealth.

§ 2 Said board shall from time to time, as it may deem expedient, cause examinations of the said waters to be made for the purpose of ascertaining whether the same are adapted for use as sources of domestic water-supplies or are in a condition likely to impair the interests of the public or persons lawfully using the same, or imperil the public health. It shall recommend measures for prevention of the pollution of such waters, and for the removal of substances and causes of every kind which may be liable to cause pollution thereof, in order to protect and develop the rights and property of the commonwealth therein and to protect the public health. It shall have authority to conduct experiments to determine the best practicable methods of purification of drainage and sewage and disposal of the same. For the purposes aforesaid it may employ such expert assistance as may be necessary.

§ 3 It shall from time to time consult with and advise the authorities of cities and towns, or with corporations, firms or individuals, either already having or intending to introduce systems of water-supply, drainage or sewerage, as to the most appropriate source of supply, the best practicable method of assuring the purity thereof or of disposing of their

drainage or sewerage, having regard to the present and prospective needs and interest of other cities, towns, corporations, firms or individuals which may be affected thereby. It shall also from time to time consult with and advise persons or corporations engaged or intending to engage in any manufacturing or other business, drainage or sewage from which may tend to cause the pollution of any inland water, as to the best practicable method of preventing such pollution by the interception, disposal or purification of such drainage or sewage: provided, that no person shall be compelled to bear the expense of such consultation or advice, or of experiments made for the purposes of this act. All such authorities, corporations, firms and individuals are hereby required to give notice to said board of their intentions in the premises, and to submit for its advice outlines of their proposed plans or schemes in relation to water-supply and disposal of drainage and sewage, *and all petitions to the legislature for authority to introduce a system of water-supply, drainage or sewerage shall be accompanied by a copy of the recommendation and advice of the said board thereon.* Said board shall bring to the notice of the attorney-general all instances which may come to its knowledge of omission to comply with existing laws respecting the pollution of water-supplies and inland waters, and shall annually report to the legislature any specific cases not covered by the provisions of existing laws, which in its opinion call for further legislation.

§ 4 In this act the term "drainage" refers to rainfall, surface and subsoil water only, and "sewage" refers to domestic and manufacturing filth and refuse.

The essential amendment of 1888 in the foregoing act consists in the italicized clause in the third section.

Appendix IV

The following table, condensed from the U. S. census of 1890 relating to Vital and Social Statistics, vol. 2, p. 3, will be found useful for consultation in regard to several of the sanitary items considered in the foregoing monograph:

(28 cities of more than 100,000 population, 1890)

	Population, 1890	Number of persons to each acre	Number of dwellings	Number of persons to each dwelling	Number of miles of sewers	House connections	Per cent of city area in cemeteries	Railroads	
								Number of trains daily	Number of passengers carried annually
Allegheny	105 287	20.7	16 543	6.4	38	7 000	6.5	78	1 912 969
Baltimore	434 439	23.0	72 112	6.0	–	–	2.2	159	2 803 303
Boston	448 477	18.5	52 669	8.5	291	52 000	2.5	854	39 107 897
Brooklyn	806 343	44.6	82 282	9.8	380	83 512	4.2	474	3 297 801
Buffalo	255 664	10.2	37 290	6.9	219	32 000	1.3	126	1 929 669
Chicago	1 099 850	10.7	127 871	8.6	525	1–	0.9	448	19 664 911
Cincinnati	296 908	20.0	33 487	8.9	98	7 447	0.7	162	4 253 250
Cleveland	261 353	16.4	43 835	6.0	146	14 000	1.0	38	388 931
Denver	106 713	10.1	18 010	5.9	61	1–	1.0	54	398 780
Detroit	205 876	15.6	36 992	5.6	293	1–	1.2	1–	1–
Indianapolis	105 436	15.1	21 138	5.0	30	1–	0.3	1–	135 216
Jersey City	163 003	19.6	18 562	8 8	57	21 440	0.8	499	867 514
Kansas City	132 716	6.4	23 140	5.7	114	1–	0.8	67	947 200
Louisville	161 129	20.4	24 999	6.5	52	10 000	4.1	100	1 250 355
Milwaukee	204 468	18.8	32 888	6.2	183	17 070	0.1	1–	1–
Minneapolis	164 738	5.0	25 281	6.5	60	21 122	1.0	306	4 034 572
Newark	181 830	16.0	23 296	7.8	87	1–	1.7	234	5 988 134
New Orleans	242 039	10.2	43 000	5.6	–	1–	0.7	4	224 137
New York	1 515 301	58.9	81 828	18.5	464	123 000	1.6	1 135	32 090 623
Omaha	140 452	9.0	20 194	7.0	73	3 100	0.2	52	340 770
Philadelphia	1 046 964	12.6	187 052	5.6	376	100 000	1.5	636	15 152 999
Pittsburgh	238 617	13.8	37 725	6.3	87	6 748	3.7	235	5 525 293
Providence	132 146	14.1	17 639	7.5	64	5 700	4.3	109	552 466
Rochester	133 896	13.4	23 954	5.6	138	12 000	2.1	20	237 455
St Louis	451 770	11.5	60 937	7.4	328	28 756	1.8	179	2 855 688
St Paul	133 156	4.1	20 976	6.4	103	4 200	0.5	152	2 622 615
San Francisco	298 997	11.1	47 183	6.3	193	1–	1.2	369	6 350 817
Washington	230 392	6.3	38 798	5.9	266	34 000	1.0	75	893 787

1) Not reported.

Appendix V

DAILY CONSUMPTION OF WATER PER CAPITA IN CERTAIN AMERICAN CITIES[1]

	1875		1880		1885		1890		1893		1897	
	U. S. Gallons	Litres	U. S. Gallons	Litres	U. S. Gallons	Litres	U. S. Gallons	Litres	U. S. Gallons	Litres	U. S. Gallons	Litres
New York	91	344	77	291	73	276	85	322	92	348	109	413
Chicago	100	378	112	424	116	439	127	480	147	556	–	–
Philadelphia	69	261	68	257	72	272	132	500	150	567	215	814
Brooklyn	59	223	54	204	64	242	68	257	86	325	79	299
Boston[2]	69	261	87	329	73	276	83	314	107	405	112	424
St Louis	61	231	72	272	67	254	78	295	96	363	85	322
Cincinnati	60	227	76	288	64	242	115	435	124	469	124	469
Cleveland	44	167	65	246	93	352	106	401	130	492	–	–
Detroit	120	454	130	492	176	666	155	586	148	560	124	469
Milwaukee	29	110	106	401	105	397	114	431	108	409	90	341
Louisville	24	91	42	159	62	235	71	269	75	284	–	–
Providence	–	–	34	129	37	140	46	174	63	238	52	197
Lowell	24	91	38	144	56	212	69	261	79	299	–	–
Fall River	18	68	28	106	26	98	28	106	27	102	–	–
Cambridge	57	216	46	174	51	193	65	246	80	303	–	–
New Bedford	–	–	–	–	85	322	98	371	91	344	–	–
Lynn	40	151	32	121	42	159	45	170	54	204	–	–

1) From table compiled by D. Brackett, C. E.

2) *Report of Metropolitan water board*, 1895. p. 158, 159.

Appendix VI

DEATH-RATE FROM TYPHOID FEVER IN CERTAIN CITIES OF THE UNITED STATES HAVING A POPULATION OF MORE THAN 50,000 IN EACH[1]

(per 100,000 population)

	1890	1891	1892	1893	1894	1895	1896	1897	1898
Albany	60	108	50	59	52	165	–	–	95
Baltimore	57	34	42	47	49	28	37	36	36
Boston	43	33	25	26	23	32	31	33	35
Brooklyn	21	21	18	18	15	16	15	–	–
Buffalo	44	56	38	37	62	28	19	18	28
Cambridge	34	20	20	21	29	15	36	13	16
Chicago	83	160	103	42	31	32	47	26	36
Cincinnati	67	62	40	43	50	36	34	47	30
Cleveland	66	52	54	47	27	36	41	21	35
Columbus	74	51	46	45	48	51	–	–	–
Detroit	18	13	51	61	26	24	19	12	18
Denver	217	93	53	57	35	30	61	–	–
Fall River	62	65	38	20	29	33	27	33	21
Jersey City	97	102	73	68	56	73	75	90	51
Lawrence	134	119	105	80	48	31	26	25	16
Lowell	82	99	90	68	62	39	42	21	27
Lynn	20	21	22	22	19	24	42	29	22
Milwaukee	33	33	31	37	26	25	17	12	17
Minneapolis	41	45	36	60	45	38	30	73	41
Newark	63	96	42	22	17	23	21	14	–
New Bedford	20	21	34	62	26	20	24	37	26
New Haven	28	20	29	31	26	34	32	24	37
New Orleans	20	23	21	15	28	41	33	50	63
New York	21	22	14	20	17	17	16	–	–
Omaha	36	20	13	14	25	12	–	–	–
Paterson	29	21	18	40	37	21	47	32	–
Philadelphia	64	64	34	41	32	–	33	33	53
Pittsburgh	131	100	100	111	56	77	63	66	73
Providence	29	47	36	34	49	31	27	15	24
Richmond	88	60	68	53	31	27	–	–	–
Rochester	33	36	52	39	12	24	16	19	–
San Francisco	45	34	32	34	37	32	29	21	16
Scranton	57	54	93	62	82	105	–	–	–
St Louis	34	30	37	103	31	19	20	–	17
Somerville	22	31	32	30	29	21	47	19	18
Springfield	32	35	83	35	31	19	21	27	26
Syracuse	33	49	34	31	45	–	–	–	–
Toledo	42	26	37	28	26	35	27	–	24
Washington	89	86	72	72	72	69	83	53	46
Worcester	17	21	57	33	32	25	14	14	12

1) Partly from *Fuertes' Water and public health*, p. 47, and reports of state and city boards of health and from correspondence.

Note on the normal chlorine map of Massachusetts

This map appears among the wing-frames in the Massachusetts portion of the exhibit.

It was the result of continuous and careful analysis of a large number of samples of unpolluted waters of Massachusetts, such as existed in the numerous springs, brooks and small streams of the state, at points above all possibility of pollution. By connecting the points indicating places where waters were collected for analysis, lines were drawn showing that a natural law existed to the effect that the amount of chlorine in the unpolluted waters diminished with considerable regularity from the seacoast inward.

The map has been found very useful as a standard for the purpose of determining the actual pollution of any given sample of water, as compared with the normal amount existing in the district from which it was obtained.

A similar map is shown by the state board of health of Connecticut, being the result of similar observations in that state, the lines being continuous with those of Massachusetts.

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